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Volume 111 *No. 6*

A New Era of Railway Progress 247

A pictorial review of seven years of remarkable change and development, both in types of motive power, rolling stock and railway shop facilities, as well as in the outlook of the industry toward its future.

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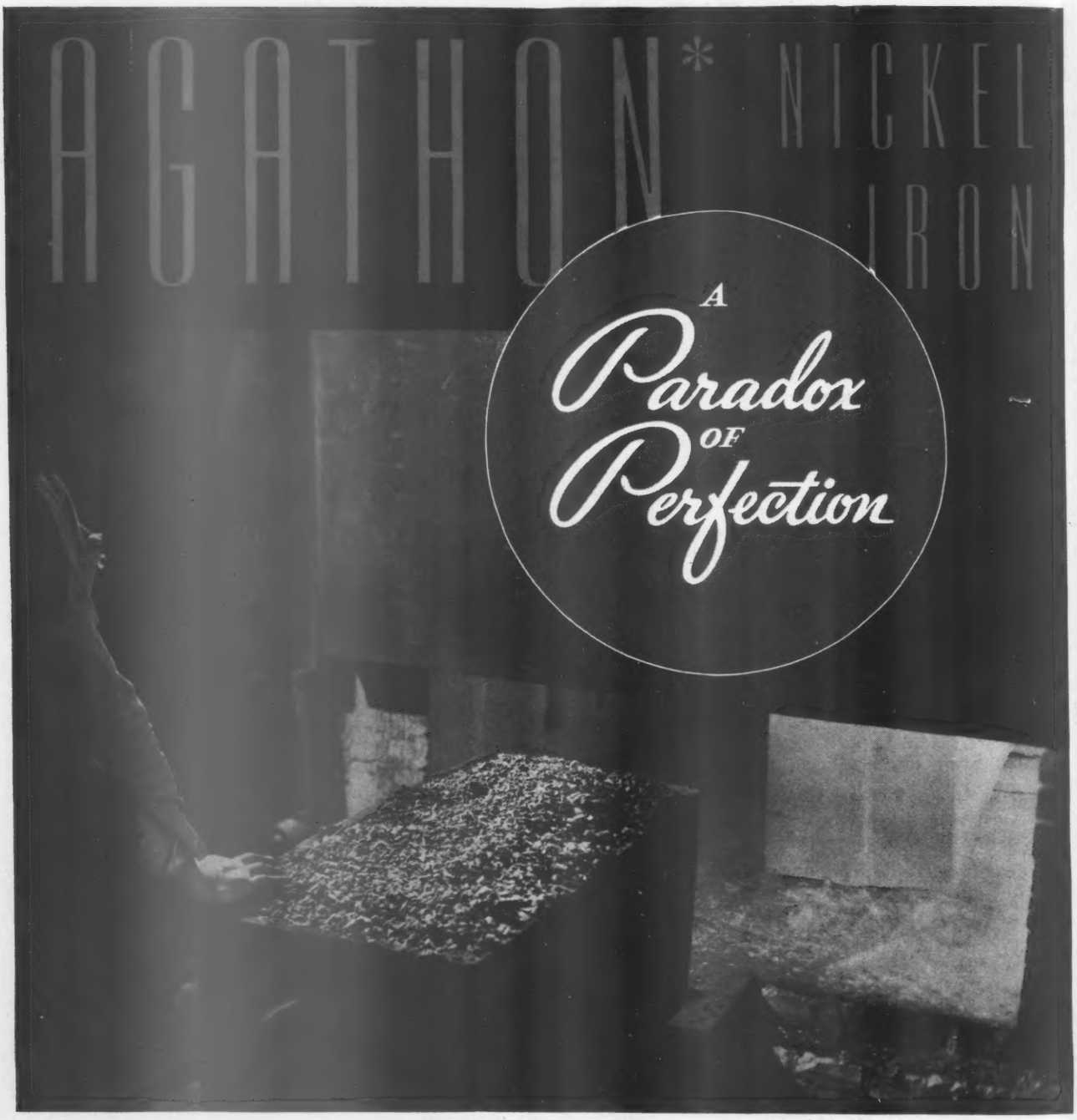

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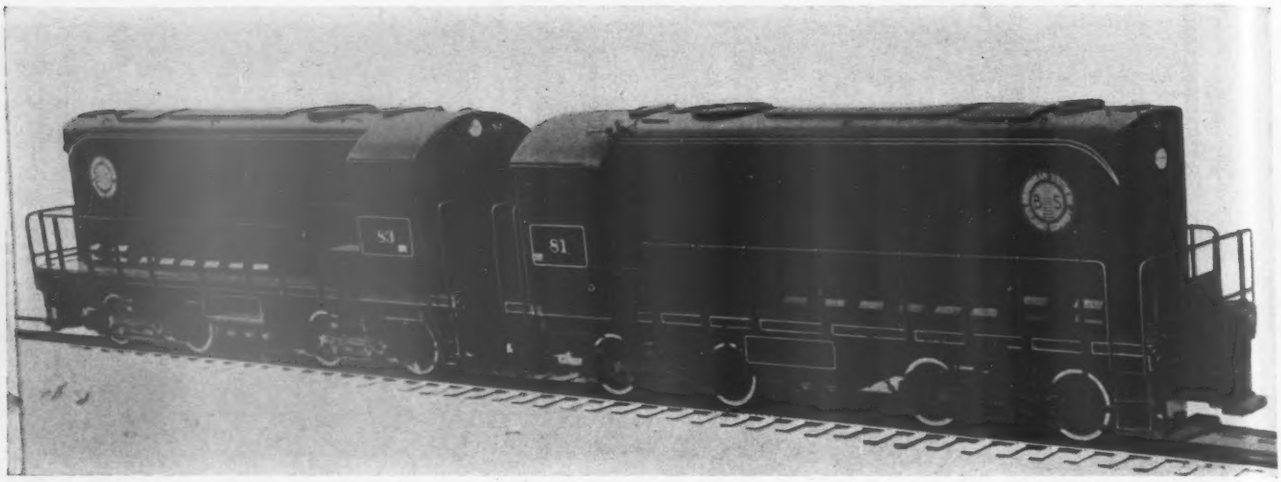
THE NEW ERA OF RAILWAY PROGRESS

SINCE 1930, when the last Atlantic City exhibit was held, the railroads and the railway supply industries alike have been subjected to a period of severe financial stress. Activities and organizations have been cut down on every hand. The stagnation resulting from drastic curtailments and widespread discouragement was, however, only a surface aspect of the situation. Imagination and initiative continued to function, even though, to a considerable extent, behind closed doors.

The review in the following pages, while not strictly confined to the seven years which have elapsed since 1930, presents some of the more striking aspects of motive-power and rolling-stock developments and repair-shop rehabilitation as they appear in 1937. Many of these developments are the direct result of the introduction of remarkable new engineering materials, changes in technique and adaptations from other fields.

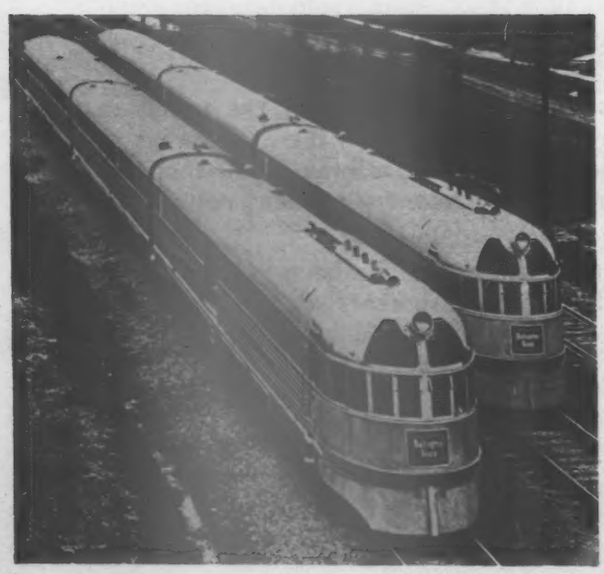
The same freshness of outlook indicated by the trends in motive power and rolling stock are evident in the adaptations to the new conditions which are seen in railway repair-shop reorganizations and the shop re-equipment movement now under way.

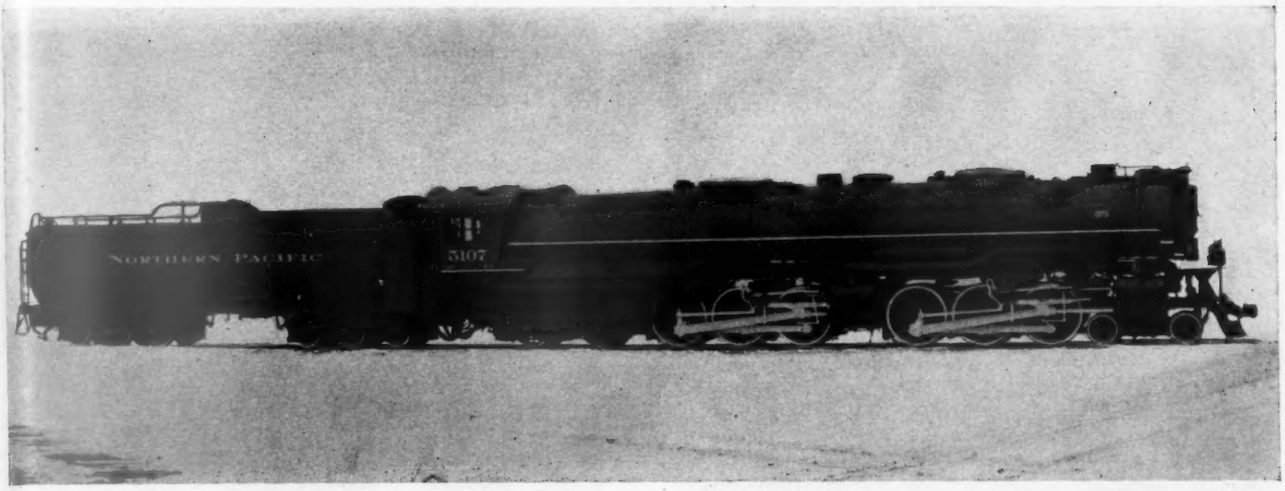
These pages present nothing new. To have one's memory refreshed concerning the accomplishments of a significant period bring its relation to the future into better perspective.



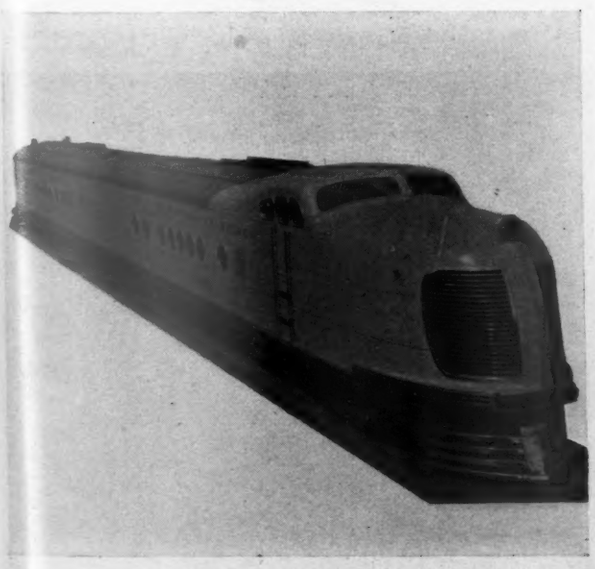
Many Tools Where Once There Was But One!

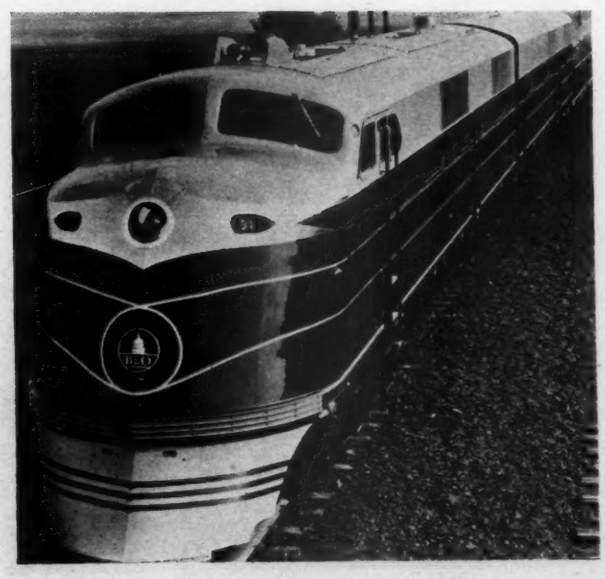
First to share the field with the steam locomotive was electrification; then came the gasoline rail-motor car. This was followed by the Diesel-electric switcher. Articulated Diesel-electric trains and Diesel-electric locomotives for road service were developed during the depression

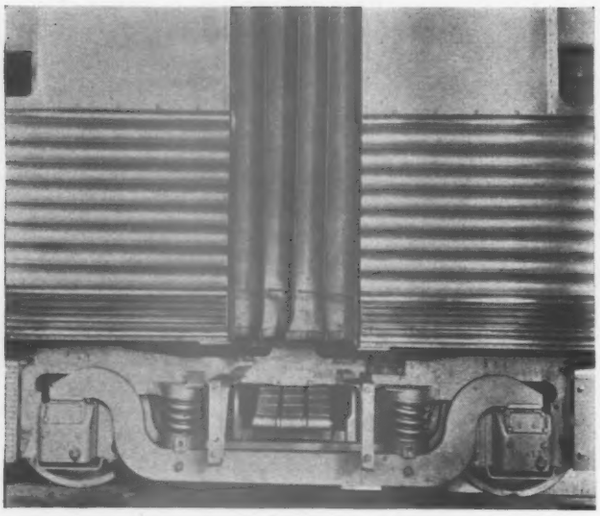


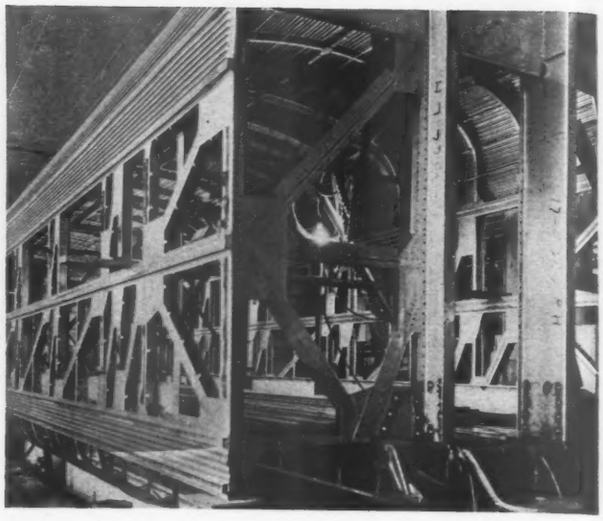


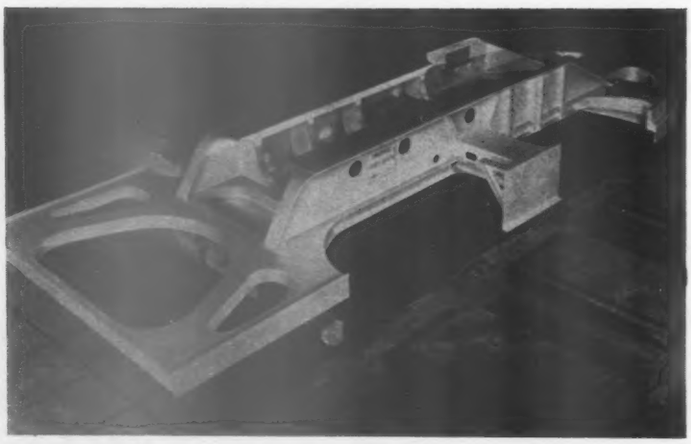
The steam locomotive, which once had the field of heavy traction exclusively to itself, is still the mainstay, relinquishing specialized services to the newer types of power. Style factors introduced with the lightweight Diesel-electric trains have won almost universal acceptance in a matter of three years. Steam locomotives for freight service are growing in tractive capacity as well as in horsepower. The articulated steam locomotive has recently become a high-speed motive-power unit



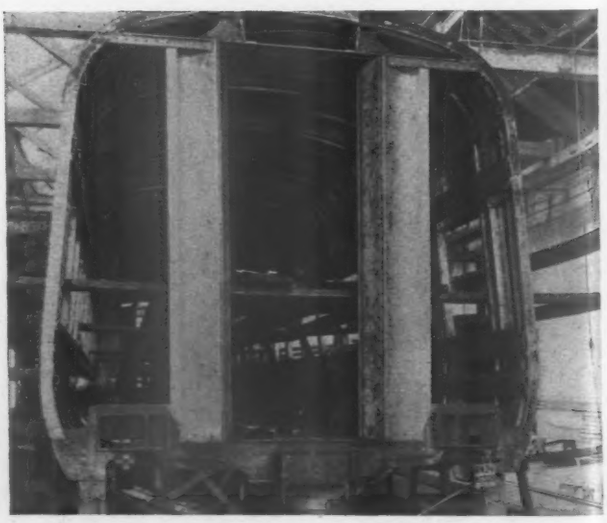


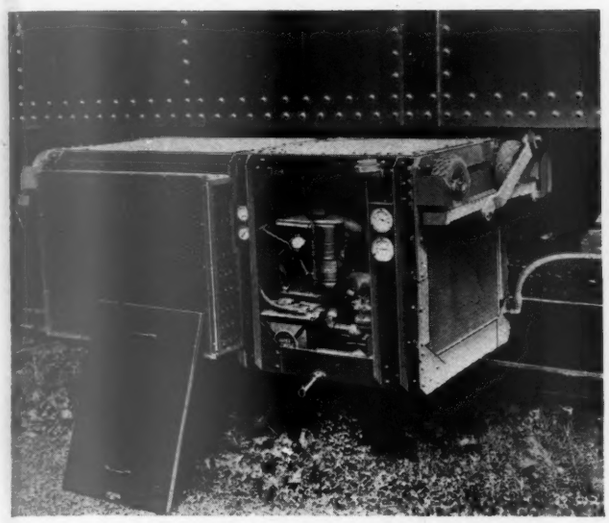


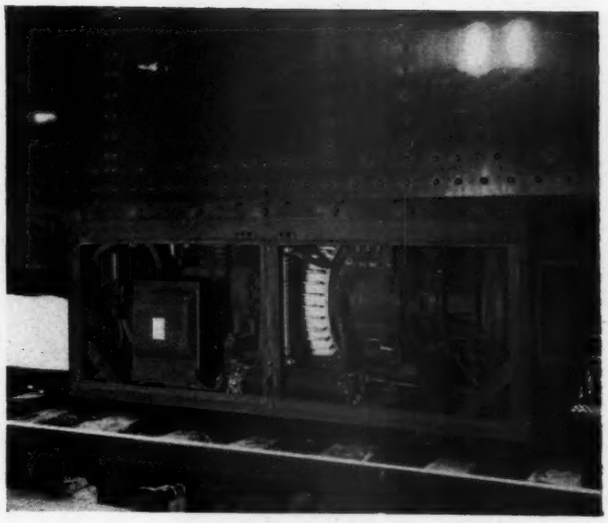


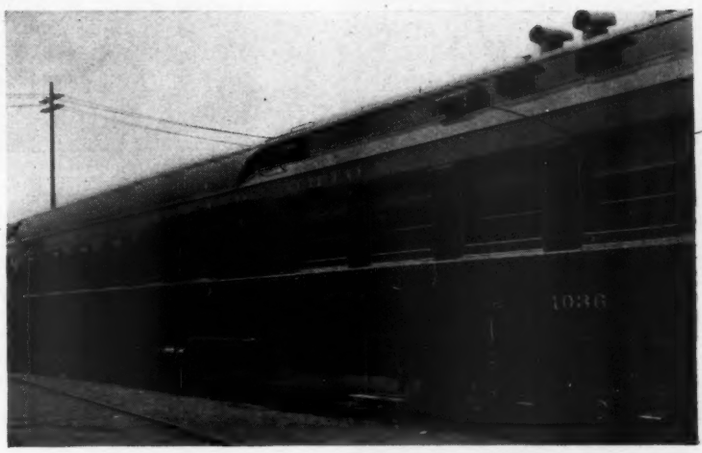


New materials and new techniques—the products of research and engineering development in many industries—are the foundation on which the lightweight streamline trains have been developed. New techniques of construction adapted to the new materials have been evolved. Welding is being increasingly employed. Articulation, rubber cushions, and tight-lock or slack-controlled couplers have contributed to smoother riding qualities. Reduced weight has decreased the demands on motive-power capacity

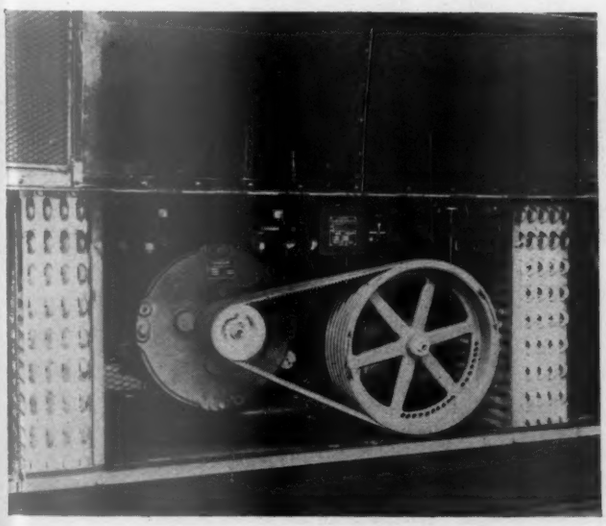


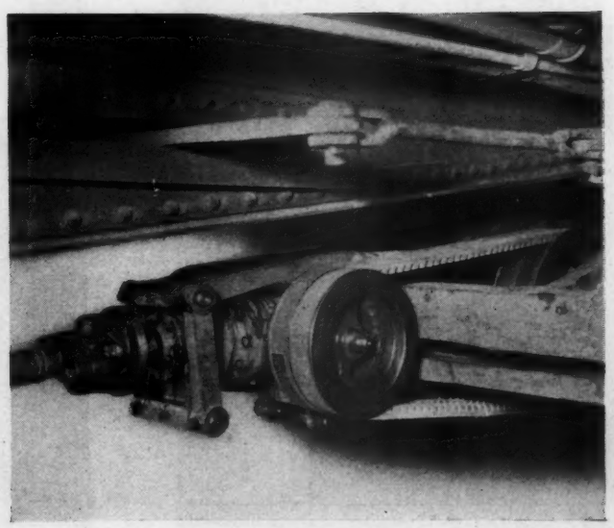






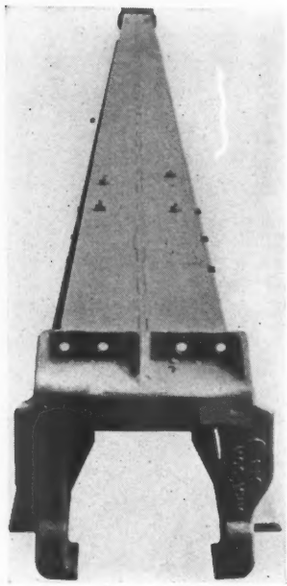
Reduced weight and styled exteriors have been accompanied by a removal of barriers, both psychological and practical, to the interior treatment of passenger cars. Air conditioning, confined to the "Martha Washington" at the time of the 1930 convention, is now applied to 10,000 cars. Aside from its direct influence on summer comfort, its accompanying system of pressure ventilation has removed the former limitations imposed by dirt on interior decorative treatment

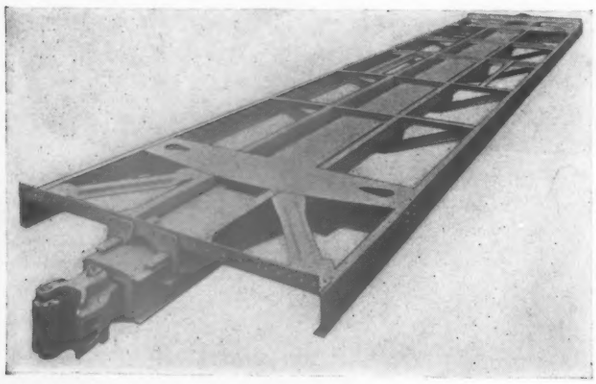




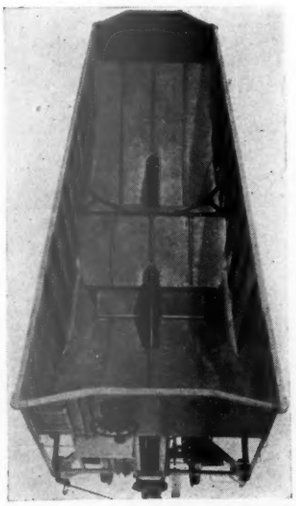
Walls, ceilings, floors—once finished in colors chosen to hide dirt—now run the gamut of shades, strong or pastel, or are finished in beautiful wood surfaces, light or dark, as the decorator chooses. Windows are softened by drapes

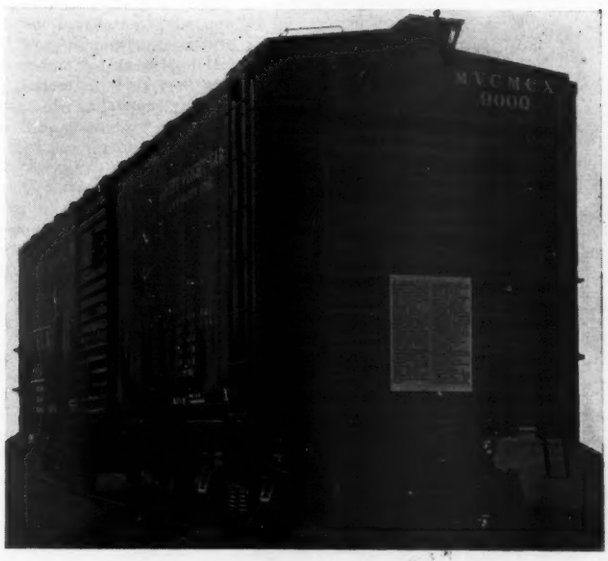
Lower ceilings and varied furniture selections make rooms out of cars. De luxe trains lack little for comfort or pleasure which can be found in the best hotels. Nor are the coach passengers overlooked



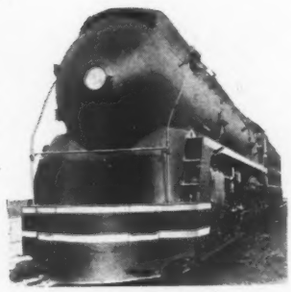


Progress in freight-car design has been no less marked than that in the passenger-car field. The new A.A.R. standard steel-sheathed box car has materially influenced design. Particularly has its center sill received wide acceptance, extending even to passenger cars. The cushion underframe is a growing factor in car construction. Welded construction is being developed by the railroads themselves, as well as by the builders

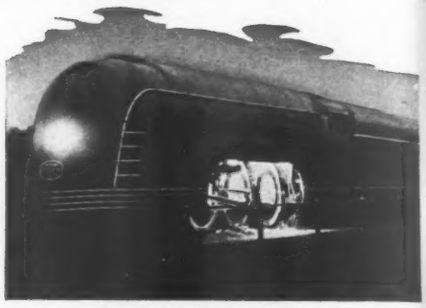


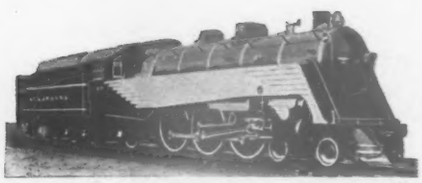


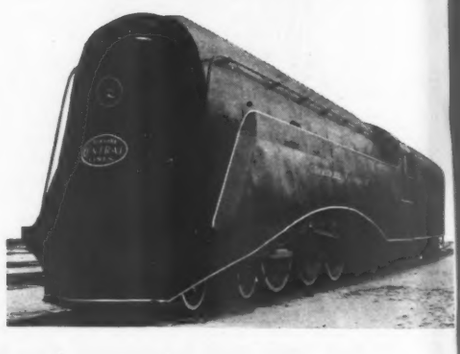
High tensile steels and aluminum alloys have both found their places in the construction of freight cars. The former, with or without welding, are making rapid progress. Cast-steel underframes and steel castings in other parts of the structure are contributing to durability and maintenance-free service

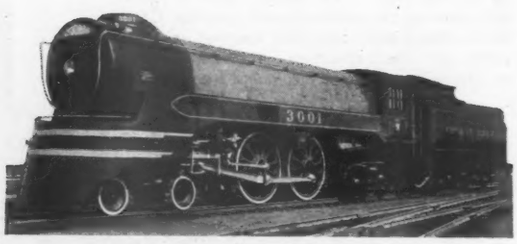


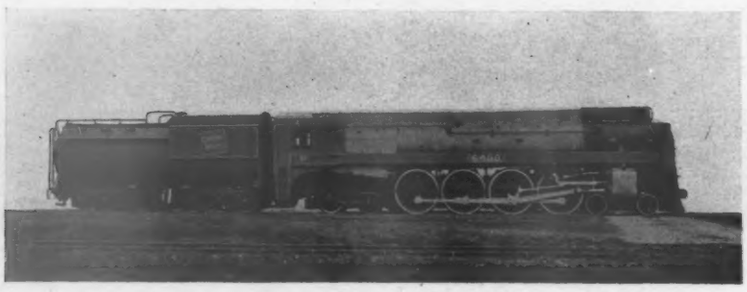
The process of the refinement of the steam locomotive goes on without interruption. The most striking recent development is the adaptation of streamlining. Several independent wind-tunnel investigations show definite possibilities for the reduction of wind resistance by smoother exterior surfaces and improved front-end contours. Not all streamline locomotives, however, are based on aerodynamic principles, although most include special provisions for smoke lifting. All, however, have distinctive style values, strongly appealing to popular fancy

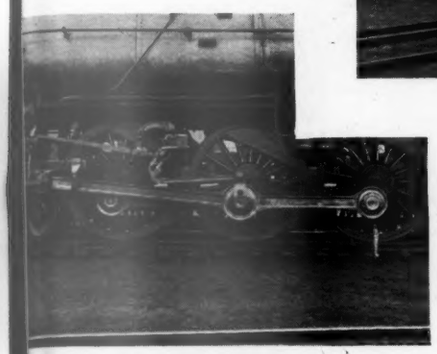




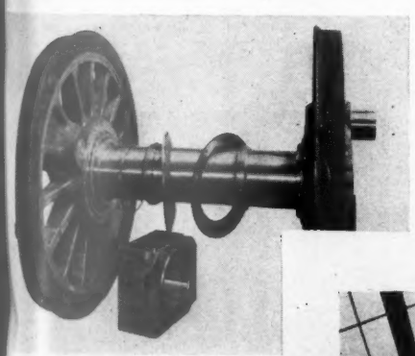


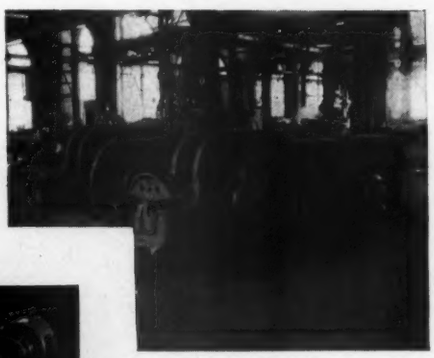


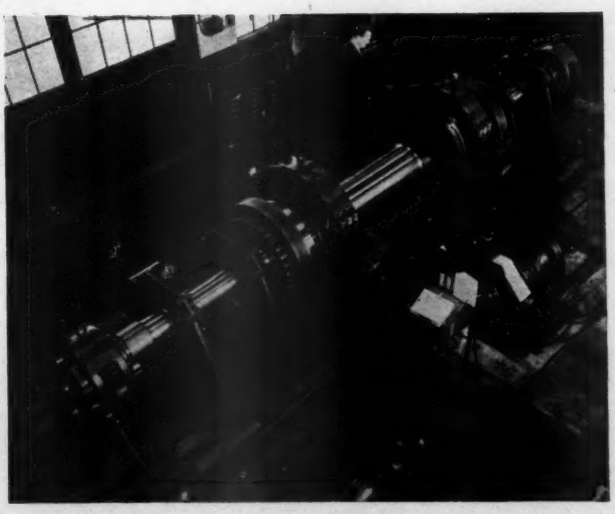




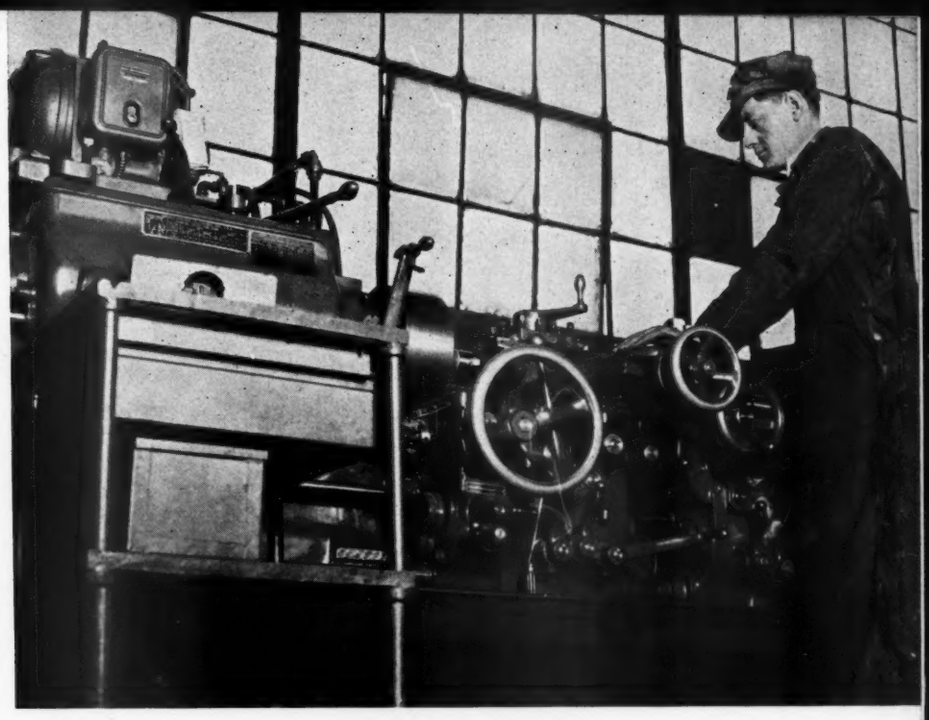
Among the engineering improvements in motive power which have been effected since 1930 the application of roller bearings to locomotive driving axles, crank pins and crossheads takes a leading place. The first locomotives to be completely equipped with roller bearings on all axle journals have now been in service for 500,000 miles. Precision of alignment, infrequent servicing attention and long life are the economic advantages of this major development. Roller-bearing rods, combined with the use of high-tensile steels in rods and reciprocating parts, are promising developments in adapting the steam locomotive to the high speeds demanded in modern passenger service. Research initiated for the adaptation of roller bearings to locomotives continues for increasing the reliability and improving the maintenance-free service of locomotive running gear



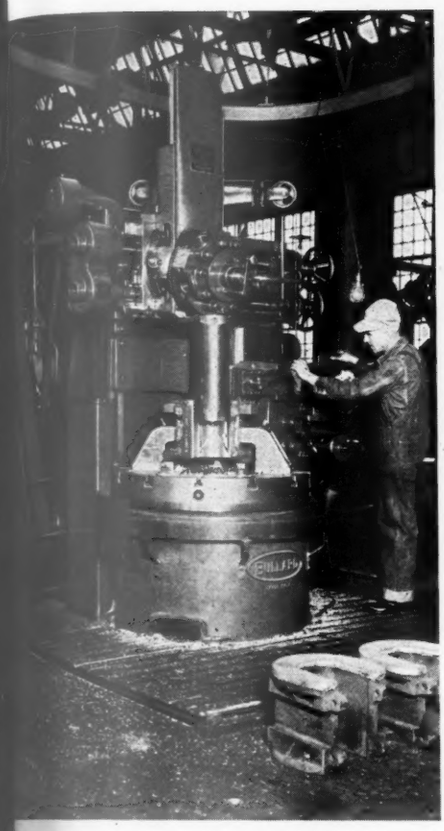




Wheels take on added importance in these days of high-speed train operation. The recognition of the necessity of accurate tire turning has been the influencing factor responsible for the installation of many new driving- and car-wheel lathes during the past two years

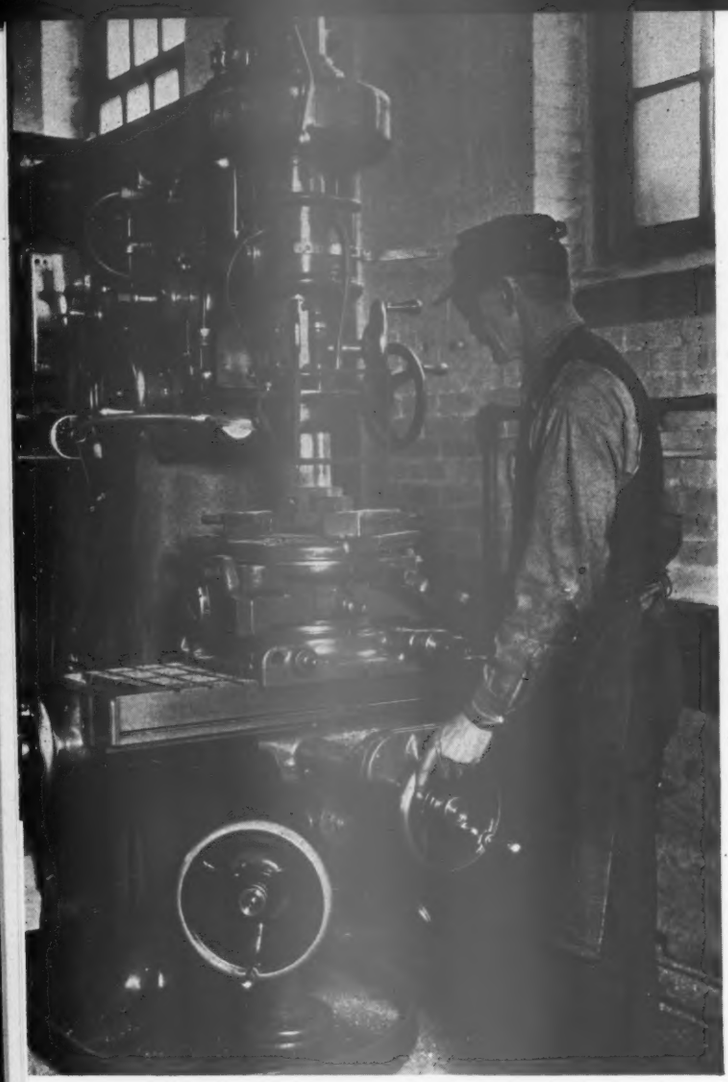


This modern turret lathe, working on a variety of brass and bronze jobs, replaced three old machines

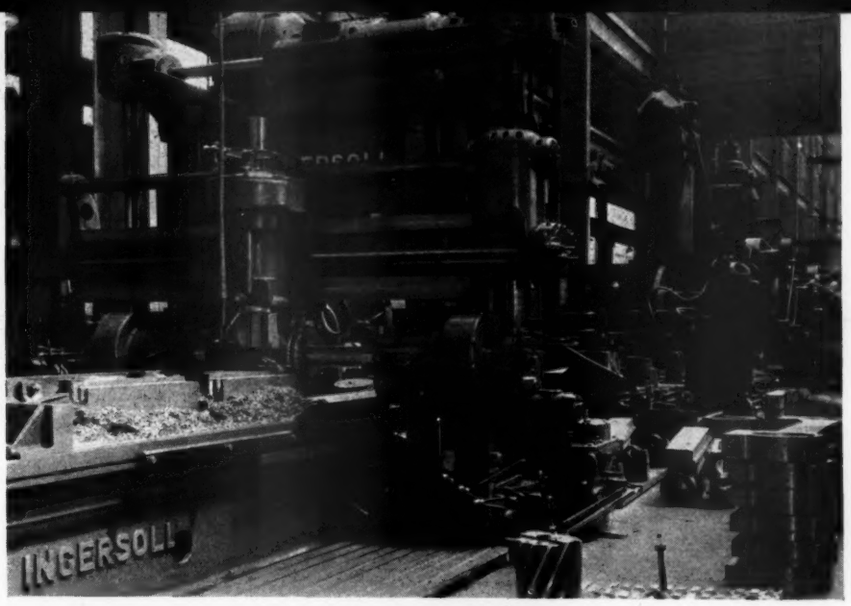


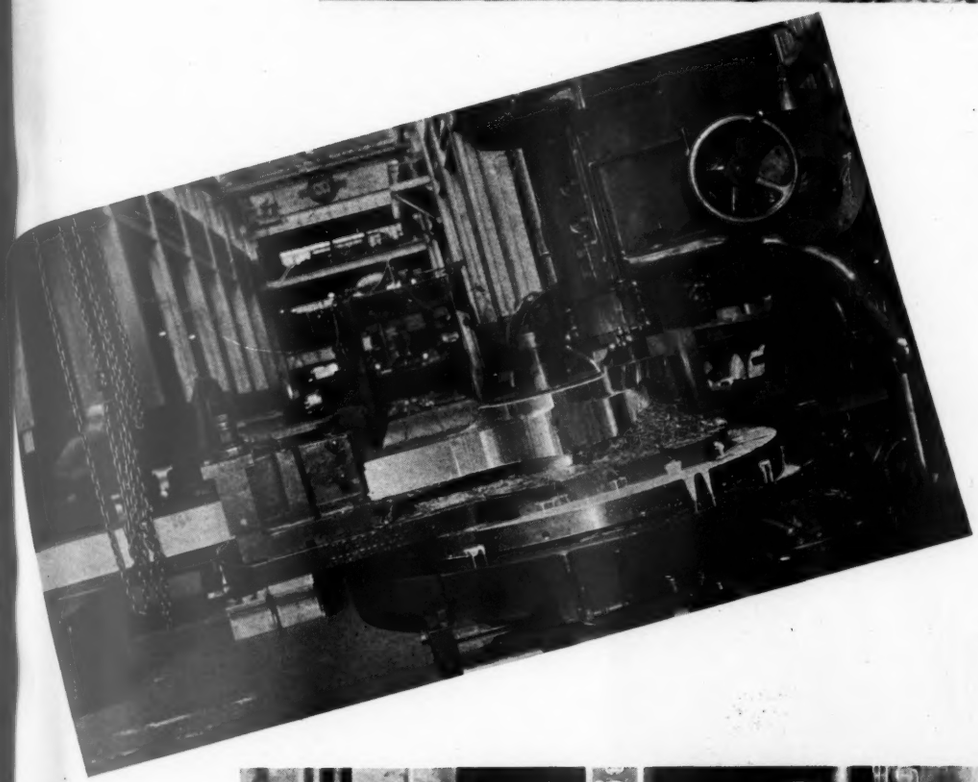
The small shop solves the problem of a special job by equipping a new standard machine with fixtures which broaden the range of use. Here is a machine which is saving 40 per cent on general work

A four-spindle automatic, typical of the machines being used in some large shops for turning out finished pins for locomotives and cars up to 2¼ inches in diameter

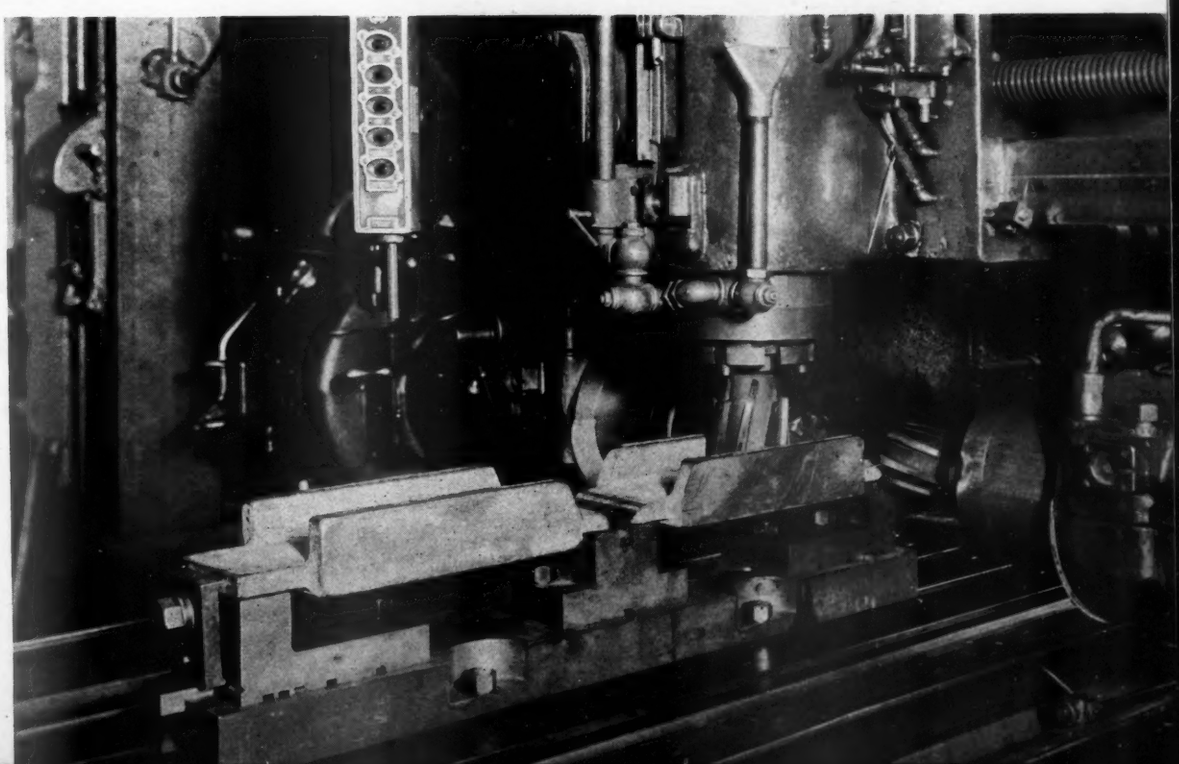


The up-to-date system tool room, such as that shown at the bottom of the page, demands the latest in precision equipment. Typical of the recent installations are the die sinker (at the left) and the electric tool treating furnace (immediately below)



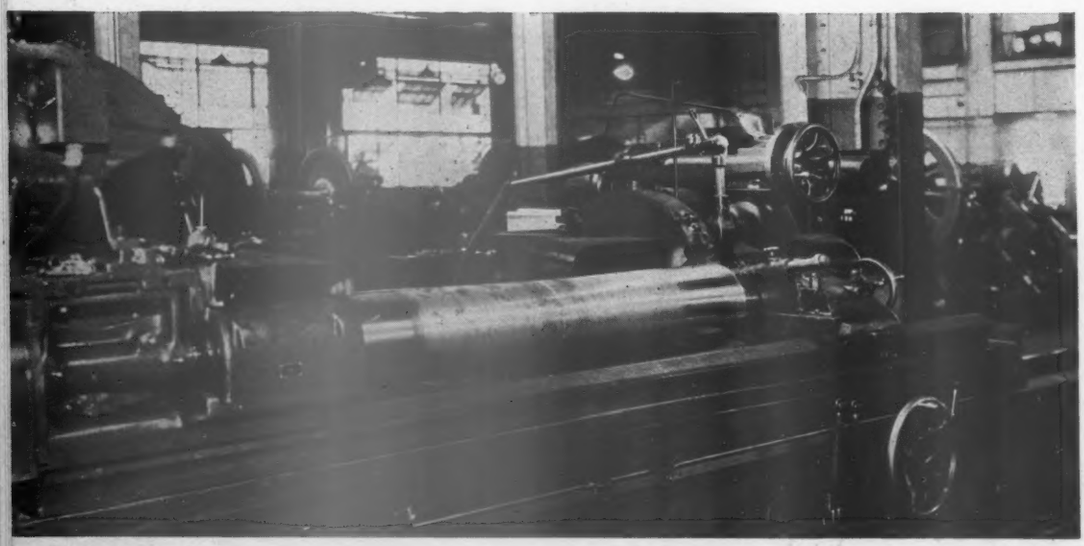


The accurate finishing of locomotive side and main rods, crossheads and shoes and wedges to limits demanded by the requirements of present-day service is a machining problem that is adequately solved by the modern milling machine

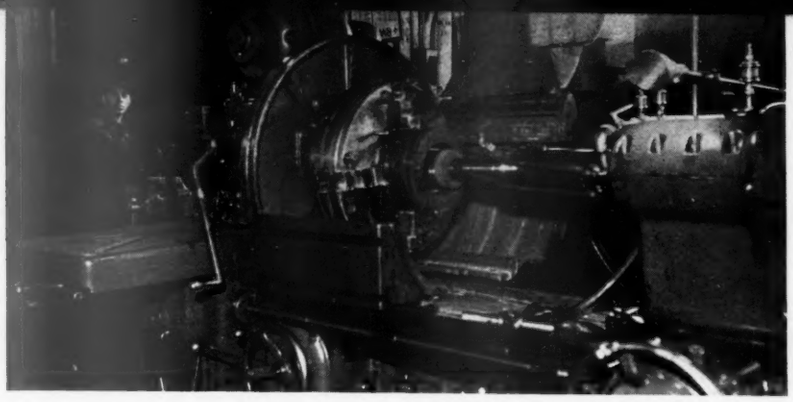


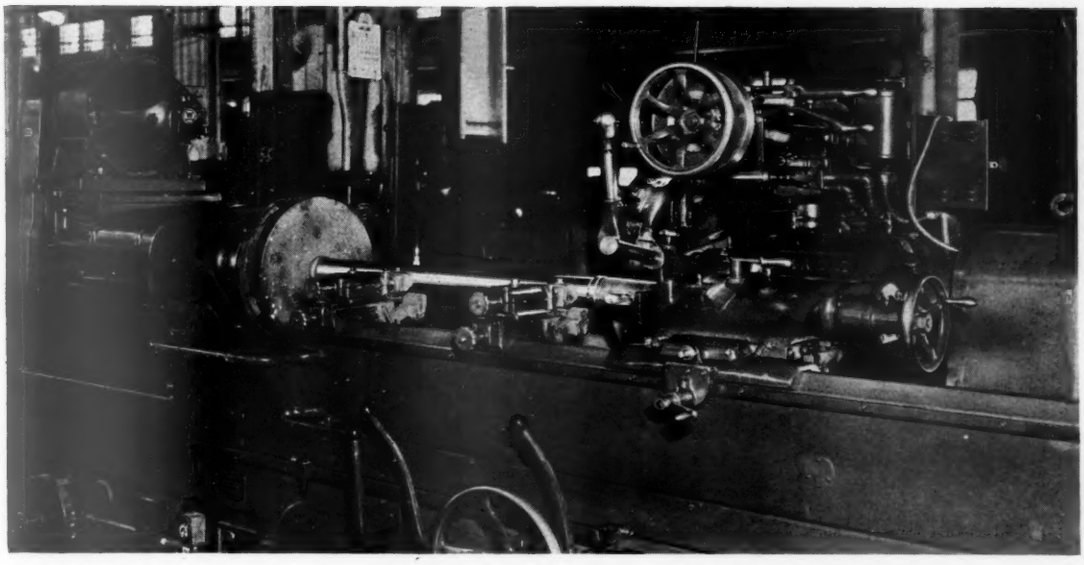
The wide-spread acceptance of roller bearings on locomotive axles has changed railroad machine shop practices. No longer can measurements on a job of this kind (the grinding of an axle tube for roller bearings) be anything but exact — The older machines, with questionable accuracy of production, are giving way to new ones, built to meet today's needs

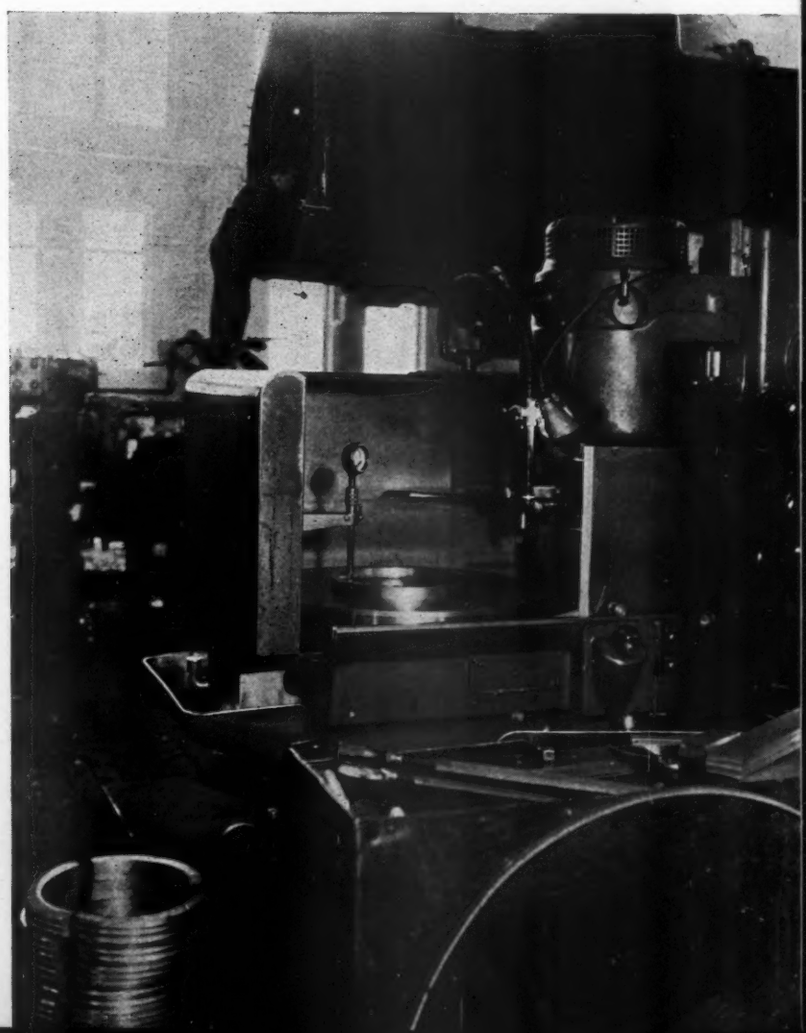
Even on small parts, such as the spring-rigging pins shown going through this centerless grinder at the rate of 50 an hour, the demand for precision is being justified by the greater length of service and lowered cost of equipment maintenance



A driving axle, which carries the wheel centers and is assembled inside the axle tube shown at the top of the page, is ground for the wheel fits on the same machine that finishes the tube





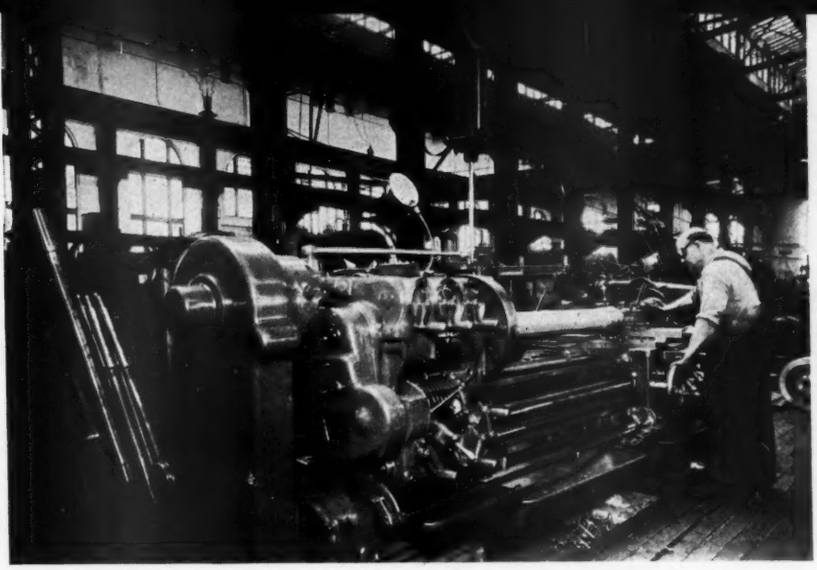


The three jobs shown on this page are additional evidence of the standard of precision which assures the satisfactory operation of the modern locomotive—At the top is an internal grinder finishing a bushing; at the center, a piston rod is being ground and, at the bottom, a retainer ring for a driving-wheel roller bearing is seen being finished on a surface grinder

The radial drill plays a most important part on a variety of shop operations involving drilling, reaming and tapping—Power, plus flexibility of speed and control simplify many difficult jobs—The machine shown here is saving from 35 to 40 per cent compared with the one replaced

The knee-type milling machine handles many of the unusual machine-shop jobs such as motion work and small rod parts —This one is at work finishing a spring seat for a trailer truck

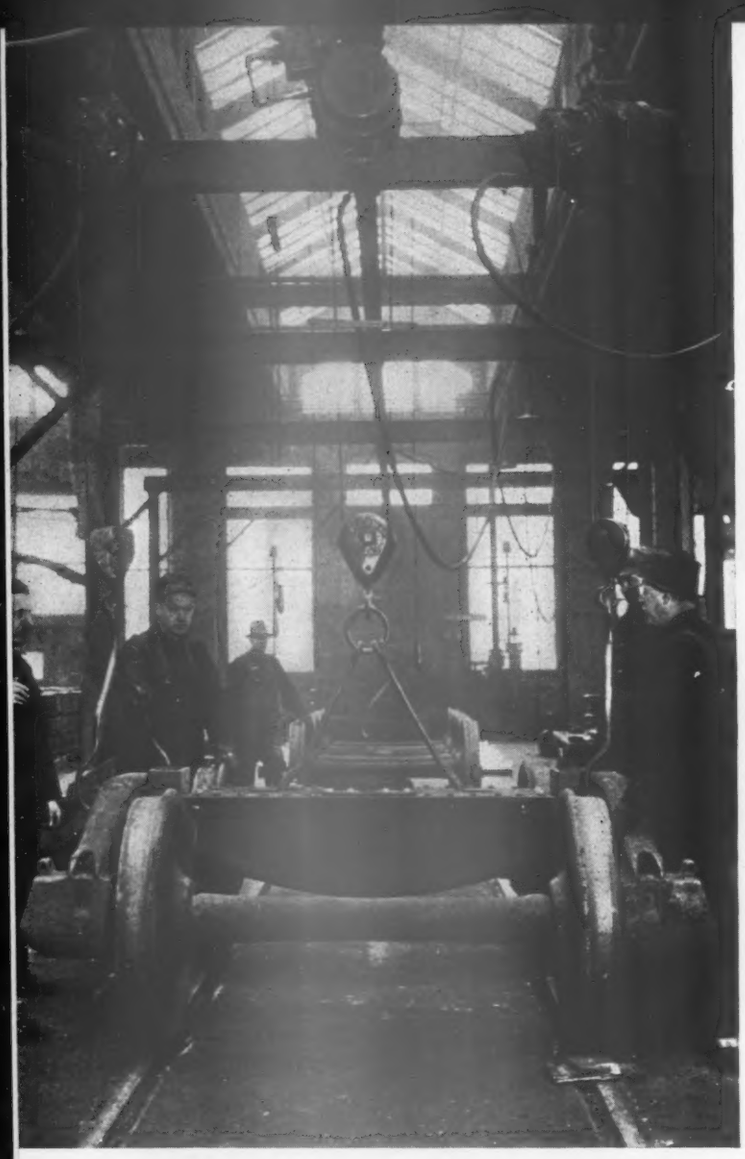
The internal grinder for the finishing of locomotive air-compressor cylinders, power reverse-gear cylinders and stoker-engine cylinders has contributed much to the reduction of repair costs



Because of the variety of heavy machining jobs on which production is not in great volume the engine lathe holds its place in the backbone of the railroad machine shop—Modern machine design plus new tool steels has speeded up the work and it is possible today to turn out many locomotive parts to a standard of accuracy that, a few years ago, was considered impossible

Quantity production of hundreds of parts used by a railroad have brought out the advantages of properly tooled turret lathes—Many of the larger shops are concentrating turret-lathe work in a separate department where constant supervision and trained operators are developing surprising reductions in the costs of machining miscellaneous parts

The hand chipping of oil grooves in the crown brasses of driving and truck boxes is gradually giving way to the special machine which cuts accurate grooves quickly

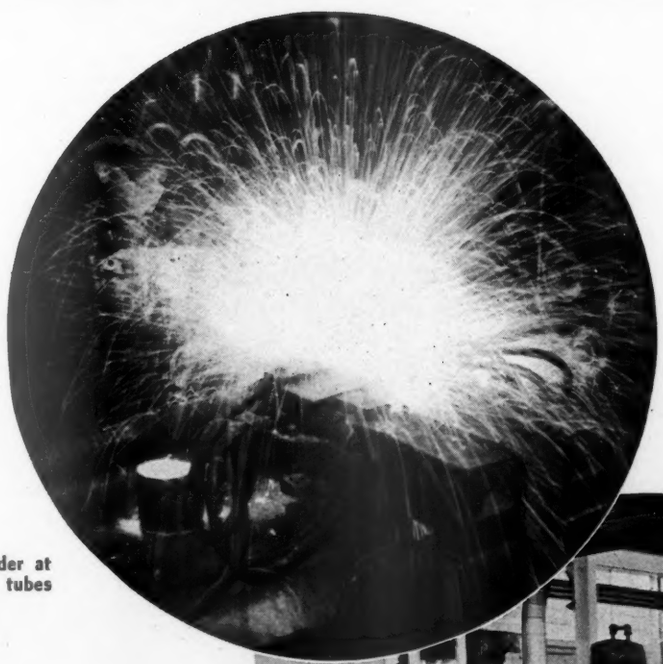


The elimination of arch bar trucks means the rebuilding of thousands of car trucks —The simple overhead pneumatic hoist installation shown here cuts truck assembly time down to 12 to 15 minutes

Welding on steel cars cuts costs, reduces weight and produces a car that stands up well under today's severe service demands

Car repair yards, spread out as they usually are over acres of ground, present many difficult problems in the handling of material—Gasoline and electric crane trucks have combined flexibility of operation with a relatively low investment cost resulting in the ability to alter car yard layouts to suit the character of the repair job at hand

The modern railroad forge shop embraces many units of equipment that have been brought into the picture as a result of the development of new steels, heat treating, forging work and shape-cutting parts



An electric flash welder at work on large boiler tubes

The ingenuity of die designers, together with the forging machine, has made it possible to produce forgings of complicated design in large quantities at lower cost

This page is just a suggestion of some of the new things that are to be seen in the railroad shop—Above: a workman lifting a side rod from the plating tank where it has been coated with zinc to resist corrosion and improve its appearance—Right: the electric tin snip, typical of many ingenious small high-speed tools—This one cuts all sorts of shapes and increases the productivity of the workman many times over the old hand shears

A close-up of a metal spray gu
working on an air-pump piston
—In one railroad shop which
within the past two years has
made a large investment in shop
equipment, the metal spray de
partment shows the largest sav
ings in percentage on the in
vestment of any shop equip
ment bought at that time

EDITORIALS

Atlantic City Convention

We are presenting in this number a "high spot" review of the progress and innovations made in the mechanical department during the past seven years, or since the last big convention and exhibit was held at Atlantic City. We hope that many of our readers will have the opportunity of visiting Atlantic City during the meeting this year, June 16-23, inclusive, in order to get a "close-up" and more complete picture of the truly remarkable progress which has been made in the design and construction of mechanical department equipment and facilities.

All exhibit space in the great Auditorium will be utilized, and in addition there will be an elaborate track exhibit. Many mechanical-department executives, recognizing the educational value of the exhibit, are arranging to have as many of their supervisors and foremen as possible visit Atlantic City during the conventions, and methodically and studiously examine those exhibits of special interest and significance to them.

The occasion will be almost equivalent to a post-graduate training course, since the outstanding improvements in recent years will for the first time be shown in one place and in an effective manner. The exhibitors are quite deliberately and carefully planning to arrange the presentation of their products to take advantage of this exceptional educational opportunity.

Some innovations will be made this year. The exhibit will be thrown open to the general public on the Saturday and Sunday intervening between the Mechanical Division meetings. Then, too, in addition to the meetings of the Purchases and Stores Division during the second week, and at the meeting of the Association of Railway Electrical Engineers on June 17, the Air Brake Association will meet on June 17 and 18. Locomotive reports will be considered during the first three days of the Mechanical division meeting, and car reports during the last three.

The Atlantic City conventions and exhibit this year have a peculiar significance. They mark a long stride in the return to more normal and prosperous conditions—they are an evidence of a return of confidence and the conquest of fear.

Some measure of the progress which is being made is indicated by the fact that the freight-car loadings for the first twenty weeks of this year were 14,377,453, as compared to 12,466,650 in 1936, an increase of more than 15 per cent.

Vice-President J. M. Symes of the Association of American Railroads, told the members of the Operating-Transportation Division, at its annual meeting in Chicago May 19 and 20, that the Car Service Division predicted freight-car loadings of over 900,000 cars per week this fall for nine consecutive weeks, with a peak week of 960,000 cars, as compared to a peak of 827,000 cars in 1936. "It looks at this time," Mr. Symes said, "as though there will be about 95,000 more serviceable cars available than a year ago. This is approximately a nine per cent gain. Can a nine per cent increase in cars provide for the loading of an expected 15 per cent increase in traffic? It can be done by efficiency in car handling, but only by the utmost cooperation between railroads, and with the Car Service Division."

General business is being stimulated in no small degree by the equipment now being built for the railways. This year, for the months of January, February, March, April and the first three weeks of May, the railways ordered for domestic use 206 locomotives, 44,562 freight cars and 446 passenger cars. The comparable figures for 1936 were 98 locomotives, 22,240 freight cars and 87 passenger cars. During the same period last year no equipment was ordered for use in Canada, while this year there were ordered 50 locomotives, 7,358 freight cars and 80 passenger cars.

Those in charge of the calling of the conventions and the holding of the big exhibit had to make their decisions a long time in advance—but they surely guessed right!

Adequate Car-Repair Facilities Needed

The need for improved freight-car repair methods and facilities on many railroads cannot be better summarized than in the following brief quotation from an address presented at the April meeting of the Car Foremen's Association of Chicago, by K. F. Nystrom, superintendent car department, Chicago, Milwaukee, St. Paul & Pacific:

"To carry out a successful and economical schedule repair program, it is obvious that proper repair facilities must be made available. In this respect the car department again has not, on most railroads, been given the consideration it deserves. There are today large railroads who do not have a resemblance of modern freight-car repair shops; some are still making

freight-car repairs out in the open. A modern repair shop will increase the efficiency in labor at least 20 per cent and also establish a considerable saving in the conservation of material and small tools.

"I believe that at the present time if a survey was made of locomotive shops, which some railroads have abandoned, it would be found that these could, at comparatively small cost, be converted into suitable freight-car repair shops.

"The location of repair shops is of great importance. They should be located where the density of traffic is the greatest and where there is a prevailing empty-car movement. Some years ago, the idea prevailed that repair shops should be scattered over the railroad, but that is not necessary. It is better to have one suitable shop with proper tools than several shops without facilities."

The Milwaukee evidently believes in the old adage that "a doctor should be willing to take his own medicine" for in 1931 it constructed a modern freight-car repair and car-building shop at Milwaukee, Wis., which has been instrumental in cutting the cost of schedule repairs from $199 a car in 1929, to $132 a car in 1936. In addition, a substantial amount of new equipment has been constructed in this shop, which is one of the best equipped in the country, particularly as to modern welding machinery, and is said to have more than paid for itself in the period of six years since it was built.

One thing about freight-car repair work which can hardly be questioned is that in northern climates subject to severe winter conditions, any heavy repair work which is performed out of doors is done with some more or less serious loss in efficiency. Higher railroad managements must be impressed with this fact, but perhaps not by such a drastic method as that followed on one railroad where the president was induced to inspect certain car-repair track work on a cold winter day and froze one of his ears during the inspection trip. A modern repair shop was subsequently built at this point, doubtless for economic as well as personal reasons!

Climb Out Of the Rut

Is it advisable for mechanical-department supervisors and foremen occasionally to visit points on their own line or on other railroads, in order to compare practices, with a view to improving their own operations? An industrial engineer told a small group recently of some well worthwhile improvements he had suggested in the operating methods of an equipment repair plant. Asked why he could go in from the outside and suggest such improvements he shrugged his shoulders and said the people in charge of the plant had allowed themselves to get into a rut.

Getting into a rut is an expensive business and it cannot be overcome by ordinary methods. Even men of constructive genius and plenty of initiative profit greatly by meeting and comparing notes with those who are engaged in like pursuits in other places. It does take time and it does involve expense to make such visits, but the average man will be sufficiently inspired and helped by such experiences to warrant the expenditure of time and money. We know of one successful railroad shop superintendent who frequently takes a few hours off to visit manufacturing plants in his own community. True, their problems and methods are radically different from those in a railway equipment repair plant, and yet this shop superintendent almost invariably comes back to his own job with some good idea which can be applied to its peculiar operations.

How does the other fellow do the job? Don't try to find what you are doing better than he is, but profit by trying to discover those ways in which he excels. The industrial engineers are not supermen. True, they are specially trained to discover weak spots and suggest better practices—the important thing, however, is that they keep their eyes and minds wide open at all times. Why not rip off the blinders and climb out of the rut; a trip to other shops or facilities on your own or some other road will make an excellent starter.

Drill Tang Breakage

An instructive engineering bulletin, recently issued by a nationally known tool manufacturer, calls attention to a well-known fact regarding the causes for drill-tang breakage which may well be re-emphasized. Drills and other cutting tools with taper shanks are driven by a combination of frictional contact with the drill socket and by the inter-lock of the tang at the end of the taper with the tang slot in the socket. Any attempt to drive the drill by either of these features alone, without the aid of the other, is likely to cause trouble which in some instances has been blamed on the drill maker.

To prevent possible difficulties from this cause, two precautions must be observed, namely, to make sure that the drill socket is not excessively worn and that it is clean and free from dirt, chips or other foreign material. The suggestion may be made that, since the tang cross-section is smaller than any other part of the average drill, it might be enlarged to prevent failure, but this would make the drills unusable in present drilling equipment and this suggestion is therefore not practicable. Obviously, the solution is to keep the drill sockets clean and recondition them as often as inspection shows that the socket has become worn out of round, bell-mouthed, or roughened on the inside.

Gleanings *from the* Editor's Mail

The mails bring many interesting and pertinent comments to the Editor's desk during the course of a month. Here are a few that have strayed in during recent weeks.

Place More Emphasis on Safety

The increase in business that has taken place in the last year or so has necessitated the rearrangement of a large percentage of the working force, a great many furloughed men have returned to duty and a sizeable percentage of new men have been taken into the service. These factors all tend to make accidents more likely to occur.

The Human Side

I like the *Railway Mechanical Engineer,* because, in spite of its highly technical articles it also contains a goodly supply of practical material that is extremely helpful to us in solving some of our more simple, everyday problems. Then, too, I like your human interest articles and comments. After all, man power is the most vital factor in our operations, in spite of the marvelous improvements that have been made in materials, equipment, machinery and facilities. The degree of efficiency and economy which result from these things, however, depends upon the human element, which must construct, maintain, operate and control them. Frankly, I sometimes wonder whether we recognize the importance—yes, vital necessity—of properly training and cultivating the human element in our organizations, in order to secure the best and most satisfactory co-operation from it. Do our supervisors and foremen, for instance, feel that they have the complete confidence of the management in dealing with the troublesome problems which confront them at every turn? Have they been coached or instructed as to how to deal with the workers, in order to inspire the highest type of teamwork? Where would a football team or baseball team get without thorough training in co-operative effort and endeavor? Are the executives doing all they should to train the supervisory staff in the art of management Are the foremen rightly approaching the problem of getting the best and most loyal service from the men under them? Are the men in the ranks and new recruits being properly trained, so that the railroads may take full advantage of more modern methods and practices, and thus more successfully withstand the various types of competition with which they are now confronted?

Large Heating Surfaces

In going through some of the older issues of the *Railway Mechanical Engineer* I noticed a comment about the remarkable heating surface of the 4-8-4 locomotives purchased by the C. & O. last year. The combined heating surface of this locomotive is 7,880 sq. ft., with an evaporating surface of 5,538 sq. ft. The C. M. St. P. & P. has a 4-8-4 locomotive which has a combined heating surface of 7,803 sq. ft., which is deserving of mention, I believe, as the second largest heating surface.

Are We Railroaders Becoming Soft?

"Hello, Boss!"

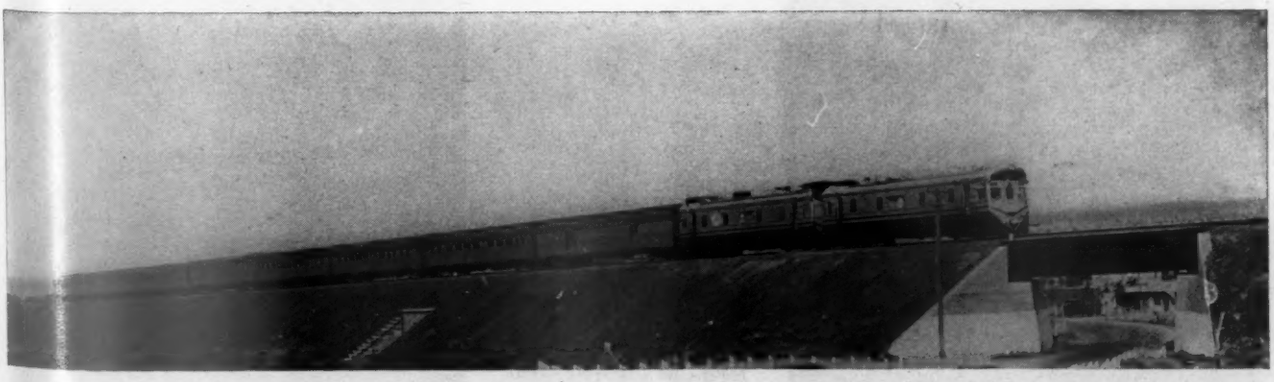
Looking up from where I was working in the garden among my spring flowers I found Old Dave, who was pensioned by our railroad at sixty-five, ten years ago. "Why, hello, Dave, how are you?" I said. "I haven't seen you for a long time, although I often think of you."

"Yes, I'm sure you do, Boss. I just dropped around this evening to let you know I got the nice letter which you sent me on my seventy-fifth birthday, although I don't know how you remembered it. To realize that you did and that you went to all the trouble of writing a letter with your pen just made my birthday the happiest ever. It was the best present I got, and I want to thank you for doing it."

"Why, that's all right, Dave, God bless you. You've made me happy, too, in coming around to tell me about it."

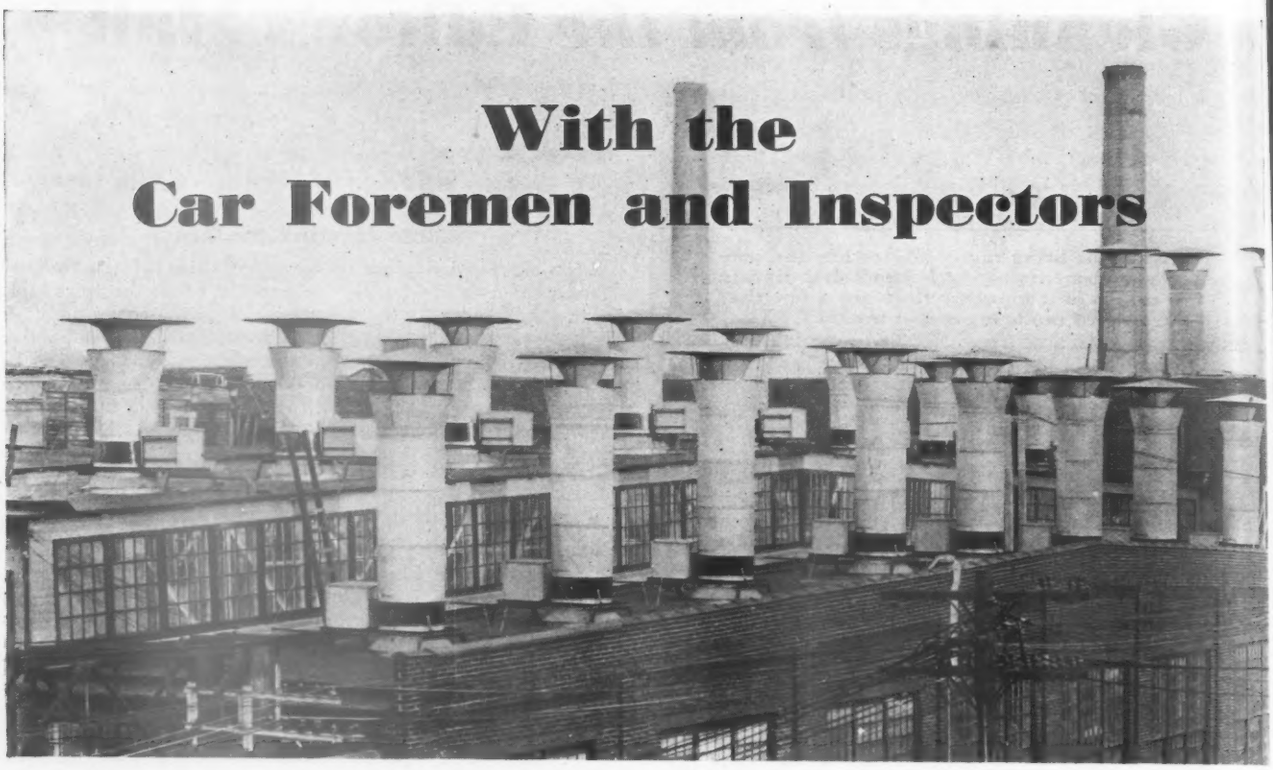
Blue Signal Rules Disregarded

On the reverse side of our time cards we are cautioned to practice safety and put tools and apparatus in a safe and serviceable condition, regardless of whether we have the approval of the foreman to use the necessary time and material. In addition to these very explicit instructions on the time cards, we are frequently reminded by bulletins and posters which originate with the Association of American Railroads that *safety must be given first consideration.* Production, however, has become such a religion that the men will not dare take the required time to do as the rules and posters and bulletins dictate. By the most vicious coercion of inspectors by dispatchers, yardmasters and train crews, the blue signal rules are worse than jokes. Because of competition, very little dead time is allowed for a train to be in the yard. Consequently, pressure is applied and trains are inspected and switched at one and the same time. Safety is a subject that, in my opinion, should be given space in your magazine more frequently.



Light-weight Super Chief on the Santa Fe, with original Diesel locomotive—The new locomotive is now in service

With the Car Foremen and Inspectors



The canopy discharge stacks on the roof of the West Albany paint shop

Features of N.Y.C. West Albany Paint Shop

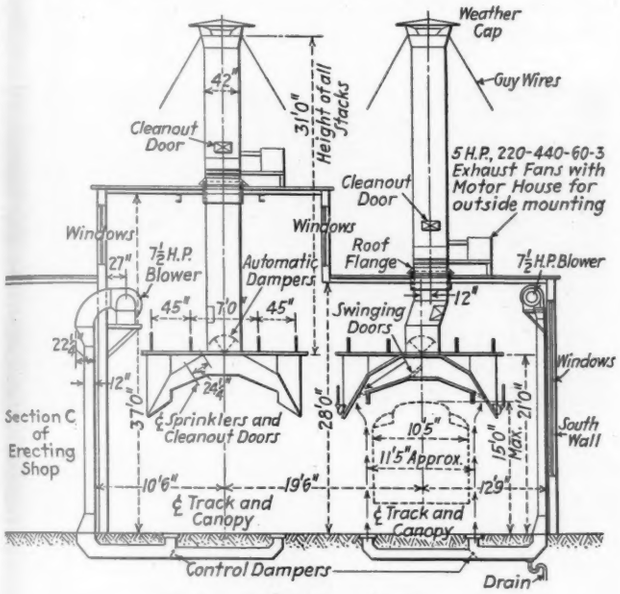
A passenger-car paint shop complete with canopy-type exhausting units, explosion-proof equipment, and facilities for replacing exhausted air with heated and filtered air was placed in operation at the West Albany shops of the New York Central system on December 9, 1936. The arrangement of this shop together with its air-replacement facilities make it one of the best equipped of its kind in the country, and makes possible a scheduled production of four cars every eight-hour working day, with a maximum of four cars in the paint shop at any one time. The number of passenger cars required in the shops at one time has been reduced approximately one-third by the installation of the spray shop. The quality of the work done is improved by the provision of an adequate supply of filtered replacement air heated when and as required.

The spray room, which was formerly a battery and electric shop, is located at the south wall end of the main passenger-car erecting shop which is 420 ft. long, 200 ft. wide and 28 ft. high under the roof girders. This building is divided into four sections—*A, B, C* and the spray room—the latter of which is separated from section *C*

Left: Two parallel exhaust canopies each 180 ft. long accommodate four cars—The canopies are divided into 18-ft. sections with separating bulkheads and one exhaust stack for each section

Right: A passenger car beneath one end of a canopy ready for spraying—Note the ample artificial and natural lighting facilities

by a fire wall. Sections *A* and *B* of the erecting shop have a total capacity of 26 cars on 13 tracks while section *C* has a capacity of 12 cars on six tracks which as a rule are reserved for puttying, knifing, and sandpapering cars before they go to the spray room for finish painting. The erecting shop and spray room are provided with transfer-table facilities on the east and west sides which make for greater flexibility in shop operation and expedites car movements in and out of the shop. All car



Section through the paint shop

movements in and out of the spray room are made during the noon hour or during the night.

The spray room is 200 ft. long and 42 ft. 9 in. wide inside. There are two tracks in the room which accommodate two cars each under exhaust canopies 180 ft. long made up of 18-ft. sections with separating bulkheads and one exhaust stack for each section. The roof of the spray room above the track adjacent to the south wall of the room is 28 ft. high, while a bay above the track adjacent to the fire wall extends the roof to a height of 37 ft. as shown in the sectional drawing of this room. Both sides of this bay, which is 9 ft. higher than the roof above the track nearest the south wall, have windows for its entire length of 200 ft. The south wall of the room, as will be observed from one of the illustrations, is approximately 60 per cent window space.

Car trimming, and the paint spraying of small car parts, is done in a building apart from the erecting shop. Separate buildings are also used for washing cars and for repairing and fabricating removable car parts, including trucks, electric generators, batteries, air-conditioning equipment, and air-brake equipment. The main car-shop offices, as well as blowers, filters, and heater units for heating, filtering, and replacing exhausted air for the spray room, are located on the second floor of the main erecting shop.

Air Replacement Facilities

The equipment for the spray room includes units for heating, filtering, and delivering the air introduced into the spray room, and also induced-draft fans in the exhaust stacks of the spray canopies for exhausting the air from the spray room. Based on an average of 12 of these exhaust fans in operation at one time, 307,000 cu. ft. of air per min. will be exhausted from the room. Of this volume 107,000 cu. ft. per min., or 35 per cent of the total comes into the spray room by infiltration through openings around doors and windows. The remaining 200,000 cu. ft. per min., or 65 per cent of the total, is replaced by mechanical means at a controlled temperature to maintain the average temperature of the spray room at 70 deg. F. during cold weather.

Of the 200,000 cu. ft. per min. replaced by mechanical means, 100,000 cu. ft. per min. is furnished by two blowers each with a capacity of 50,000 cu. ft. per min., located in a heating room on the second floor above section *C* of the erecting shop; 75,000 cu. ft. per min. is delivered by a blower which was formerly a part of the erecting-shop heating system, and 25,000 cu. ft. per min. passes from section *C* of the erecting shop through ten 1¾-ft. by 6¾-ft. filter-equipped openings in the spray-room fire wall. Two unit heaters, each with a capacity of 12,500 cu. ft. per min. are located near the roof of section *C* of the erecting shop, as shown in one of the illustrations, to compensate for the heat

Left: Air for the spray room is drawn in through a set of louvers and passes to a bank of spun-glass filters

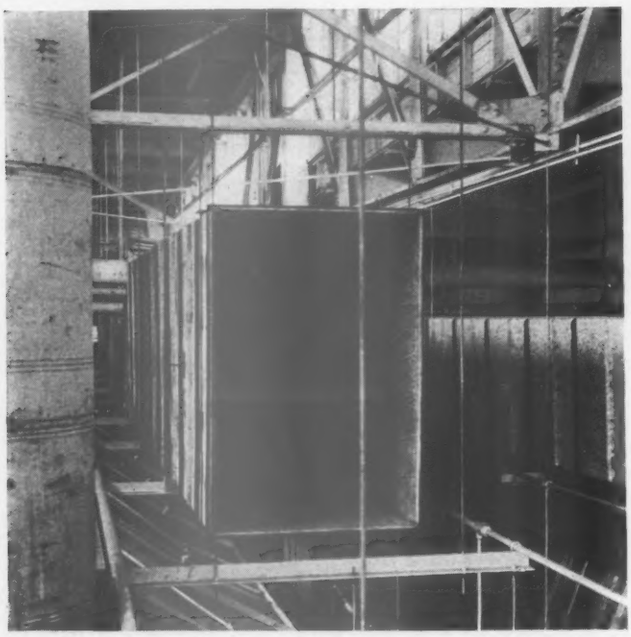
Right: The outlet side of the filter bank—The air passes over the heating coils shown at the extreme right or by-passes the coils through the door shown in the foreground

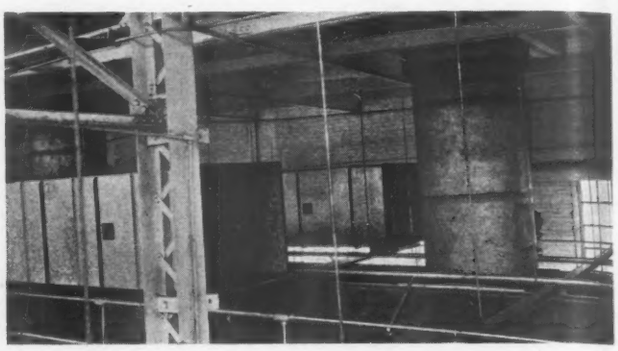
loss occasioned by the 25,000 cu. ft. per min. of air which passes from this section to the spray room through the ten filter openings in the fire wall.

The 75,000 cu. ft. of air per min. furnished by the blower which was formerly a part of the erecting-shop heating system is filtered before being delivered to the spray room, and when required it can be heated to a maximum temperature of 126 deg. F., which temperature may be required to maintain a spray-room temperature of 70 deg. F. with infiltration of extremely cold outside air through doors and windows. The air from this blower is delivered by two ducts, one at each end of the spray room. Each of these ducts runs the width of the spray room and is located beyond the ends of the canopies and above their lower side; both ducts are drilled with 1¼-in. holes in the side nearest the canopy and in the bottom for diffusing the air at low velocities into the spray room.

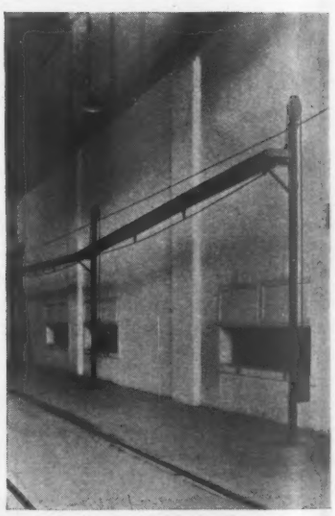
The 100,000 cu. ft. of air per min. supplied by the two blowers in the heating room above section *C* of the erecting shop, is drawn in through louvres in the east side of the shop; the louvers can be blanked off by hinged doors to control the volume of incoming air as required. This air then passes through a filter bank 21 units wide and six units high containing 126 throw-away type spun-glass 20-in. by 20-in. by 2-in. filters. From the filters the air passes through two fin-type coil heater banks which have a sliding partition between them for regulating the volume of air which passes over the heater coils; the volume can be controlled so that the maximum temperature of the air delivered to the spray room will be 126 deg. F.

The heated air from one of the 50,000-cu-ft.-per-min. blowers is delivered to the spray room through a side outlet into a 75-ft. duct which runs into the spray room over the exhaust canopy nearest the fire wall. This duct is made in three 25-ft. sections 3 ft. 6 in. wide, with heights of 7 ft. 3 in., 6 ft. 4 in., and 5 ft. 4 in., respectively. This duct has two rows of 1 in. by 15 in. slots spaced on 4 in. centers cut in the top and in the side facing the fire wall. The air from the other 50,000-cu.-ft.-per-min. blower passes through a Y-connection bottom outlet and is delivered into the spray room by two 100-ft. ducts over the top of the canopy nearest the south wall of the room. These two ducts are 3½ ft. square for their entire length of 100 ft. The duct nearest the south wall of the spray room has 1-in. by 15-in. slots in the top side spaced 11 in. apart. The other square duct has 1-in. by 15-in. slots in the top side spaced 5½ in. apart. All of these three ducts over the canopies have back-draft dampers located 3 ft. from their ends. The slots in the three ducts over the canopies diffuse the air at very low velocities over the portions of the canopies equal to the length of the ducts, with the remainder of the air being

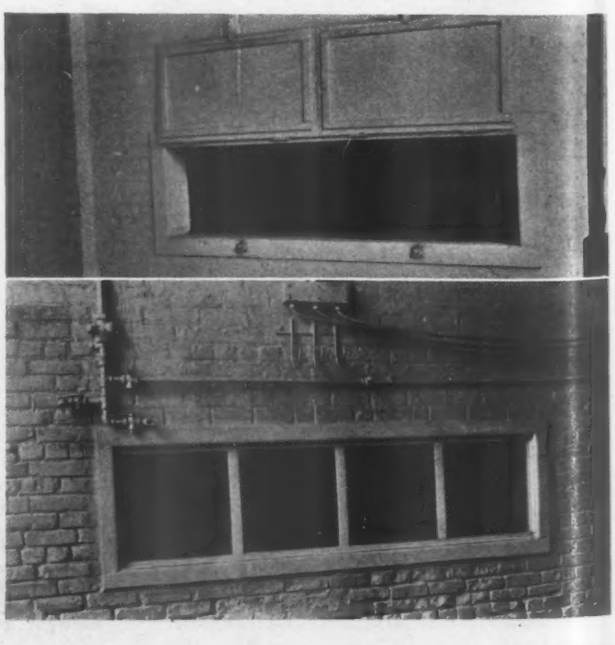




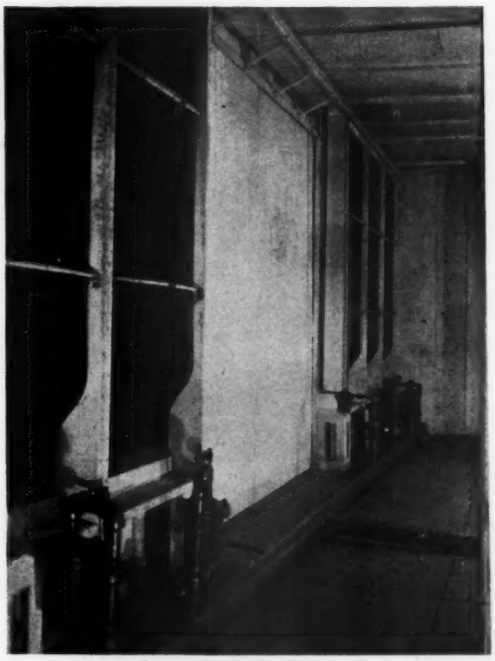
Left: Outlet duct from one of the 50,000-cu.-ft.-per-min. blowers—Top: The two outlet ducts from the other 50,000-cu.-ft.-per-min. blower



Right: The erecting-shop side of the fire wall showing filters for the air entering the spray room from section C of the erecting shop—Bottom: The inlet and outlet sides of the filter banks in fire wall between Section C and the paint shop



Left: The two heater coils with the separating door wide open for passing a minimum amount of air over the two coils—The filter bank can be seen through the door



Right: The heater coils with the separating door closed for passing a maximum amount of air over the two coils—During extremely cold weather the air can be heated to 126 deg. F. with the doors in the position shown in this view

One of the two unit heaters in section C of the erecting shop, each of which replaces 12,500 cu. ft. of air per min. that passes through the fire wall between section C and the spray room

The fan room above section C of the shop—The duct in front of the room delivers 75,000 cu. ft. of air per min. to the paint shop from the erecting-shop heating system

blown from the ducts at a velocity which does not exceed 3,000 ft. per min.

The design of all five ducts in the spray room is such that the air is delivered into the spray room at velocities which eliminate all drafts. This provides comfortable working conditions in the spray room and improves exhaust conditions. With an average of 12 exhaust fans removing an air volume of 307,000 cu. ft. per min. from the spray room, 23,400 B.t.u. per hour are required of the heating system to maintain a spray-room temperature of 70 deg. F. with an outside temperature of 0 deg. F. However, 23,900,000 B.t.u. per hr. are available from the combined heating units which will take care of heating extra air drawn into the spray room by infiltration through openings around doors and windows; this total will make up the entire heat loss in the 307,000 cu. ft. of air per min. exhausted through stacks.

The steam supplied for the fin-type heaters previously mentioned is taken from the main shop supply line and is reduced from 120 lb. per sq. in. to a maximum of 60 lb. per sq. in. A thermostat in the steam line to the unit heaters will shut off the 50,000-cu.-ft.-per-min. blowers in the event the steam temperature falls below 240 deg. F. This precaution is taken to prevent the coils from freezing should the steam pressure and temperature fall to such a point where sub-freezing air drawn over the heaters might freeze the coils.

Canopy Exhaust Equipment

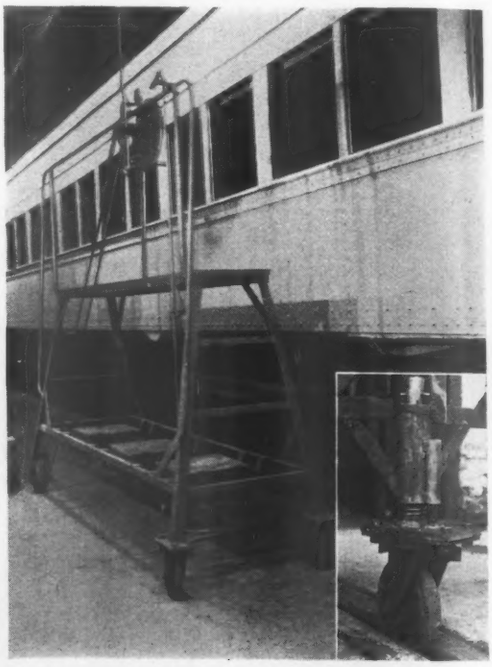
The two exhaust canopies in the spray room are 180 ft. long and are made up of 18-ft. sections with separating bulkheads and one exhaust stack for each section. Thus the amount of air exhaust from the room can be controlled as required, the number of sections in operation being determined by the location and number of spray operators working. The exhaust stacks have clean-out doors and dampers, the latter of which are kept closed when the section is not being operated, thus economizing in heating costs by preventing the escape of air from the room at such points where exhausting facilities are not needed.

The exhaust stacks have weather caps designed to pro-

erator, thus protecting him from all fumes and odor. These fumes and odors are carried into the canopy and exhausted by the fans in the stacks. Distributing plates in the floor ducts are used to maintain a uniform air-delivery pressure through the slots at velocities which can be varied between 200 and 500 ft. per min. The sectional drawing of the spray room shows blower locations and delivery ducts. All four blowers are located in spray room and delivery ducts from those on the south wall lead directly to floor ducts while those on the fire-wall pass through the wall into section *C* and return through the wall at its base into floor ducts. All of these ducts are shown in the sectional drawing of the paint shop.

The canopies in the spray rooms are fitted with deflectors so that the flow of air from the floor slots can be diverted to permit air flow directly upward past the side of the car, through the car for interior painting, or across the top of the car for roof painting; in the latter

Top: Finished car leaving the paint shop—The inlet air louvers can be seen above the car—Left: One of the 50,000-cu.-ft.-per-min. blowers

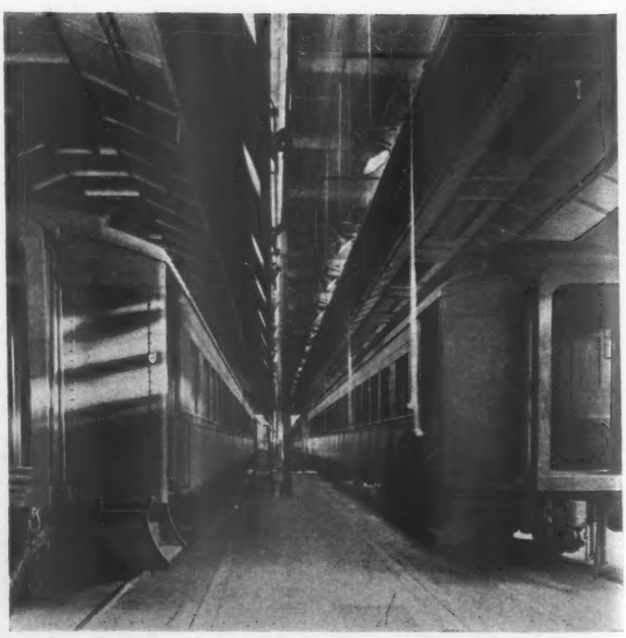


Right: Dolly used in the paint shop when spraying upper sections of car sides —The insert shows the compensating device on one of the dolly wheels to prevent tipping when running over floor irregularities— Bottom: Artificial lighting facilities include thirty 300-watt lights at each edge of each one of the canopies

tect the interior from all weather conditions and to allow the air to pass out to the atmosphere with a minimum of resistance. Sufficient clearance between the roof and the exhaust piping is obtained by the use of roof collars. Sheet-metal aprons, installed directly above and as a part of the roof-collar assembly, are furnished for the deflection of rain, sleet and snow.

The fans for exhausting the canopies are driven by motors located outside the stack and connected to the fan by means of V belts. The V belts are covered with a cast-iron vapor-proof housing and cover plate sealed with a rubber tube gasket, thus avoiding fire hazard and conforming to the Underwriters' Code. The fan shafts run on ball bearings.

Air ducts of steel and concrete construction are utilized for forcing a current of air upward through longitudinal slots in the floor. These slots parallel the track and run the entire length of the canopies. The location of these slots and ducts can be observed in the illustration showing a sectional view of the spray room. Air for these ducts are furnished by four 7½-hp. explosion-proof motors directly connected to fans which circulate spray-room air. The narrow curtain of air from the floor slots passes upward between the car and the spray op-



case the air is passed over the car roof and upward through an opening, thence directly through the stack.

Spray-Room Lighting

As previously mentioned the south wall of the spray room is approximately 60 per cent window space and the roof bay above the canopy nearest the fire wall has windows on both sides for its entire length of 200 ft. General artificial illumination is furnished by 120 vapor-proof 300-watt lights, 30 of which are located at the edge of each side of the two canopies, the arrangement of which can be observed in several of the illustrations. These lights are mounted in vapor-proof reflectors at approximately 6-ft. intervals along the lower edges of the canopies. There are also six batteries of three 200-watt 75-ft. extension lights in the room which are used for interior car painting; these lights are enclosed in steel guards and vapor-proof glass protectors. All switches

Duct at one end of the spray room which delivers filtered air from the shop heating system—This duct at the west end of the room, and a similar one at the east end of the room deliver 75,000 cu. ft. of air per min.

for the overhead and extension lights are controlled by explosion-proof toggle switches.

Control Circuits

Main switches for the operation of all motors and for the overhead lighting units are located adjacent to the heating room above section *C* of the erecting shop. They are controlled remotely from push-button stations placed in gangs at four points on the side walls of the spray room. The main switches can also be controlled manually at the switch, so that a maintainer, working on one of the motors, can disconnect the circuit at the switch without any danger of someone starting it from the push-button station.

Spray-Room Painting Facilities

The spraying facilities includes ten 5-gal., one 10-gal., and two 15-gal. spray tanks. The air pressure for the spray guns varies from 10 to 20 lb. at the tanks and from 40 to 60 lb. at the transformer which is the pressure at the head of the spray gun for atomizing the paint.

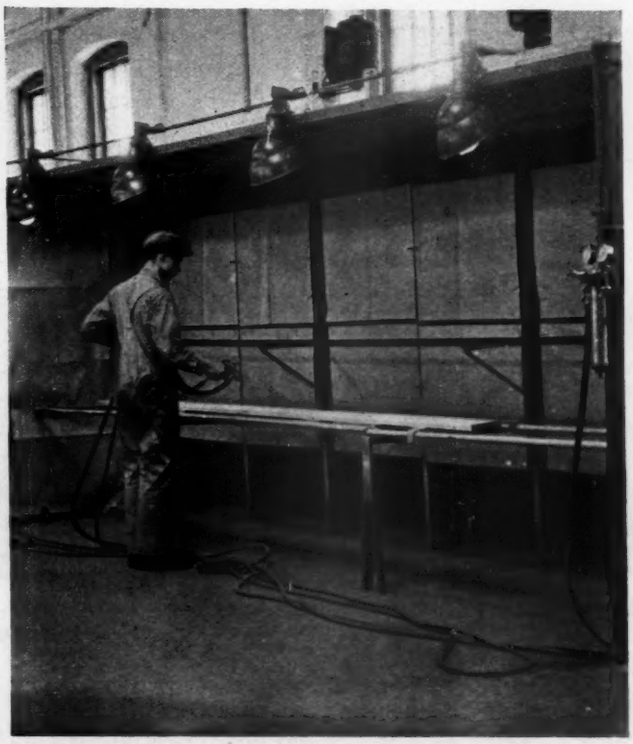
A self-propelled dolly, shown in one of the illustrations is used by the spray operators for painting the upper car exteriors. This dolly is of all-welded construction, and is fitted with four 6-in. rubber-tired wheels, one of which is provided with a sprocket wheel with a driving chain attached to a large driving sprocket mounted on the rail above the dolly platform. The spray operator can move and can guide this dolly by means of this chain drive and steering apparatus along the side of the car as the spraying proceeds. One of the wheels of this dolly is designed with a spring-actuated adjustment to prevent unbalancing or tipping of the dolly when it passes over floor irregularities; this arrangement is shown in one of the illustrations.

Sequence of Car Repair Movements

When a passenger car arrives at the shops it is stripped and if a complete paint job is required all old paint is removed and the car is placed in the spray room where a priming coat is applied.

All removable car equipment, including air-brake, electric and air-conditioning equipment, as well as upholstery, doors and windows are removed to various shops for repairs. Trucks are placed in a truck shop with a capacity of 12 car sets where they are dismantled and repaired.

After the cars are repaired they are moved from the erecting shop to a wash shop which has a capacity of eight cars on four tracks, where all operations incidental to preparing the car for painting are performed. The car is then taken outside the wash shop and the underneath parts are sprayed. Sheet-metal shields made to window size but with holes cut in the centers for ventilation purposes when painting the car interiors are applied in place of the sash. The car is then placed in section *C* of the erecting shop where puttying, knifing and sandpapering are done. The cars are then blown out and placed in the spray room for applying finishing



One of the individual spray booths in the trim shop—Each booth is equipped with exhaust fans, complete spray equipment and adequate lighting facilities

coats to both the interior and exterior of the bodies. In painting car interiors the wall surfaces are sprayed first, after which they are masked by hanging curtains from the side-plate molding; finishing coats are then applied to the ceiling. The window sill and side-plate molding are cut in afterwards with a brush. A passenger car is completely painted, including priming, knifing, puttying, sanding, surfacing and application of finishing coats, in five days. The average head-end car is completed in four days. The car is lettered, and two coats of clear penciling applied over the lettering in the trim shop while the car is being finish trimmed.

Work in the Trim Shop

The trim shop is equipped with cabinet shop and spray-painting facilities to permit complete reconditioning of all trimmings in that shop. The spray-painting facilities consist of two 20-ft. and four 8-ft. spray booth equipped with exhaust fans and vapor-proof lights for spraying small car parts such as luggage racks, sash, lighting fixtures, hardware, dining-car chairs, and all other trim.

After trimming, the car is completed by applying batteries, electric lights and shields, seat backs and cushions, and all hardware. The air, steam, water and electric systems are tested and the car is gaged, adjusted for height and weighed. Upon completion, the cars are delivered to the transportation department.

Wabash Expedites Triple-Valve Repairs

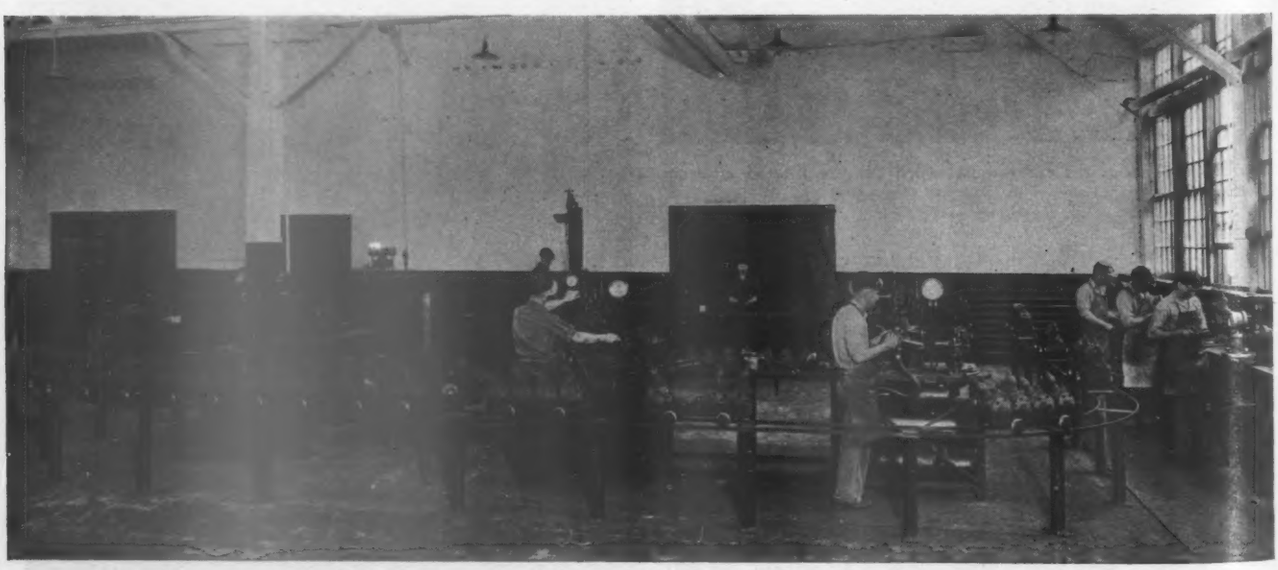
The fact that whenever repair operations are adequate in volume and sufficiently repetitive in character, railroads are not slow to organize them on a production basis, is nowhere better exemplified than in the case of triple-valve repairs as now handled at the Wabash shops, Decatur, Ill. Since June 1936, triple-valve repairs for the system have been handled in this modern air-brake room, a feature of which is the progressive movement of the valves in an orderly manner from one repair position to the next on small carriages which move freely and always in one direction on an elevated narrow-gaged track which extends entirely around the air-brake room.

This track arrangement is similar to that employed at the Sayre, Pa., shops of the Lehigh Valley, but has been changed in a number of particulars to adapt it to the space and other requirements peculiar to Decatur shops. For example, the floor layout is more compact, being included in a space 32 ft. long by 29 ft. wide in one corner of the shop. The main triple-valve repair bench is located against an outside wall with windows of ample area to admit plenty of daylight. In addition, the shop walls are painted white and supplementary light is provided when needed by eight 300-watt electric lights equipped with modern reflectors and suspended from the roof framework.

The track runway which surrounds the air-brake room is made of ½-in. by 1-in. rectangular steel rails, spaced 11 in. apart and welded on cross plates which are, in turn, welded to short vertical 3-in. pipe sections which support the rails 28-in. above the shop floor. The radius of the outer rail of this track at each corner is 6 ft. A 5-ft. bridged opening is provided for the entrance and exit of trucks and trailers loaded with triple valves.

The carriages, 16 in number, are made of ⅛-in. sheet steel cut out at the corners, bent and welded to form shallow boxes which are mounted on small wheels. Each carriage is 8½ in. wide by 28 in. long by 4 in. high, and is designed to accommodate four triple valves. As shown at *C* in one of the illustrations, four half-circles are cut in each side of the carriage to accommodate the triple-valve graduating stem nuts and the retarding device bodies, thus positioning the triple valves and allowing them to rest neatly in the carriage. The carriage wheels are equipped with Hyatt roller bearing wheels for greater ease of movement.

Equipment used in this air-brake room includes an air-motor-driven stripping machine *S* and work bench located inside the rail near the back wall; a long work bench with four triple-valve stands *T*, material bins, etc., under the windows; two 3-T test racks, equipped with counterweighted electric nut-tighteners *M* and separated by a 5-ft. work bench; a small capping bench; a third 3-T test rack *R*, available for use when necessary; work bench *W*; and *UC* test rack *U*. The stripping bench is



Modern-equipped air-brake room of the Wabash at Decatur, Ill., featured by excellent lighting conditions and the provision of a triple-valve carriage track

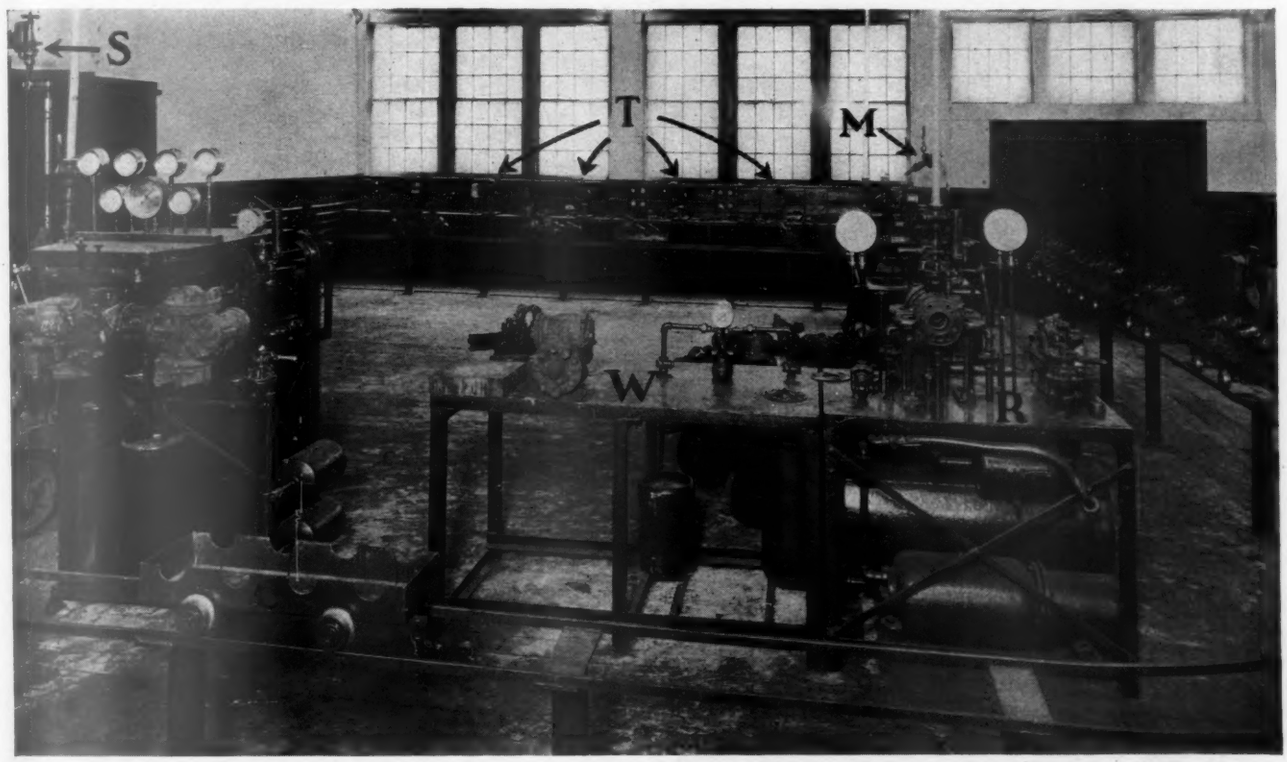
equipped with a nut-removing machine driven by air motor *S*, the drive shaft being provided with flexible and slip joints, and a head in which adapter sockets may be easily applied for the different size nuts used on cylinder caps. Similarly, at the two 3-T test racks most commonly used, a counter-weighted electric nut-tightening device *M* is provided which may be readily pulled down and used in tightening cylinder-cap nuts. An adjustable slip chuck on this device permits tightening nuts to exactly the desired tension without danger of stripping the threads.

In the operation of this air-brake room, triple valves are delivered on a trailer which holds about 40 valves, through the 5-ft. bridge opening in the rails. The triple valves are passed to the stripping bench where they are disassembled, blown out with air and all parts washed with kerosene. The cylinder-cap graduating stem and spring are gaged and if OK, the cylinder caps are sent directly to the 3-T test racks for subsequent assembly on the repaired valves after the feed-groove tests are made.

Other parts of the valves are loaded in the carriages and moved to a position opposite the triple valve repair stands. Here each cylinder is gaged and if beyond the predetermined limit of wear, held out for shipment to the manufacturer for the renewal of the bushing. If the bushing is in good condition, the piston ring is fitted and the slide and graduating valves spotted in accordance with the usual practice. A metal polish with exceedingly fine abrasive action is employed for all lapping and the use of files is prohibited. The check valve is ground in, a new rubber seat applied in the emergency valve and the check-valve case applied to the triple body, with a new gasket if necessary. The retarded-release parts are checked and the triple valve reassembled with the exception of the cylinder cap, then being replaced in the carriage for movement to the test rack.

The usual testing procedure is followed on the 3-T test rack where the first operation is to apply the feed-groove test device and make sure that the feed groove is within the desired limits of wear. On removal of the feed-groove testing device, the cylinder cap is applied, using the electric motor-driven nut-tightening device *M*. Other tests are made in accordance with the code of tests specified for this equipment. After testing, each valve is placed back on the carriage and moved to the capping bench, where a protection cover is applied and the valve loaded in a trailer for movement to the store room, and subsequent shipment to outlying points as needed.

The production in this well-organized air-brake shop is dependent, of course, upon the demand for triple valves and the number of men employed. It may also be said that the number of valves repaired per man per day varies considerably, dependent upon the condition of the valves, some of which may be badly worn and others only slightly. The force usually employed at this shop consists of five mechanics, one helper and one apprentice. The output averages 80 valves per eight-hour day which includes complete overhauling, testing and capping ready for shipment.

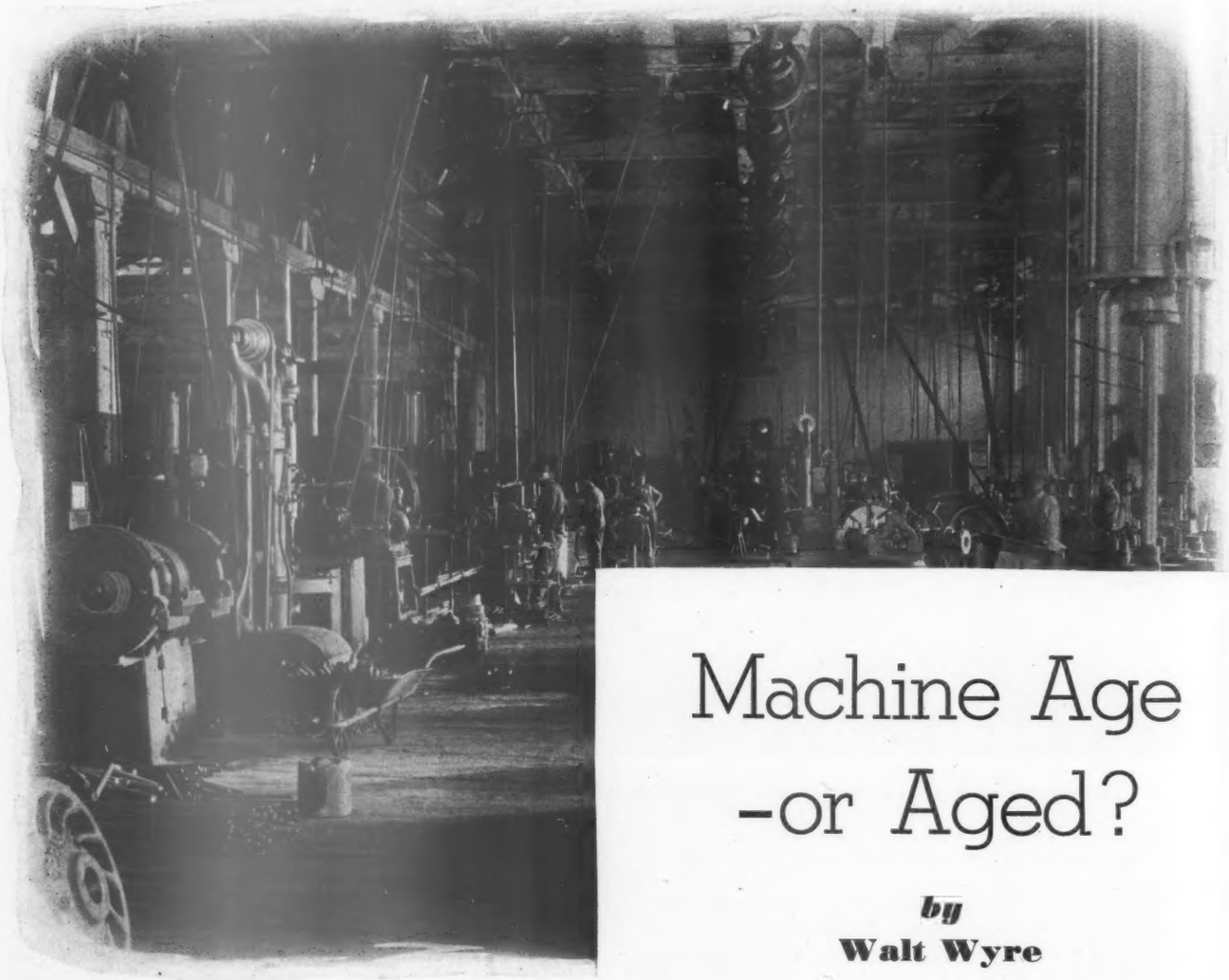


Track and carriage details are shown in the foreground of this view of the Decatur shop air-brake room of the Wabash

* * *

PROGRESS.—Millions of words have been spoken and written about railroads, and among those which linger in the mind are a sentence or two from a speech M. W. Clement, president of the Pennsylvania, made some years ago. He said: "All I ask you to do is to watch the trains go by and you will say to yourself: 'Without any fuss, without any blowing of horns, here is an exemplification of the progress of American history; a progress just as great as that made by any other industry. Here is an industry—transportation—that has tied this country together from its very birth.'"

IN THE BACK SHOP AND ENGINEHOUSE



Machine Age -or Aged?

by
Walt Wyre

"Too much overtime, too many engine failures, too much material, too much valve oil, too many personal injuries," Jim Evans, roundhouse foreman on the S. P. & W. at Plainville, remarked as he thumbed through the pile of letters, traingrams, and messages on his desk. "Seems there's too much of everything but locomotives."

"Yeah, they are never satisfied," John Harris, the roundhouse clerk replied. "If locomotives ran on free air some of the big bosses would holler."

"The cost of turning engines here is pretty high, but blamed if I see how we can cut down any under the circumstances." Evans bit off a hunk of "horseshoe" and started to the roundhouse.

The 5087 that had just come in on a drag was standing on the lead. Engineer Hawkins who came in on her was looking the engine over. Evans turned and went to see what the engineer had to say about the engine.

Hawkins had plenty to say and he wasn't bashful about saying it. The booster wouldn't cut in except when going down hill, the water pump was on a sit down strike, valve and piston packing was down and the locomotive had less power than the Republican party last presidential election.

Evans listened to the engineer's recital of the locomotive's defects, spat reflectively, and asked: "Is that all that's the matter with it?"

"No, the air pump is lazy and she rides like a log wagon on cobblestones."

"O.K., we'll get her fixed up." Evans turned and started to the roundhouse.

"I forgot to tell you she don't steam good, either," Hawkins hollered at the departing foreman.

Evans stopped at the drop-pit to see how the 5090 was coming along. It wasn't coming, at least, not very fast. The two machinists and their helpers were giving excellent imitations of relief workers on a Saturday after-

noon. One of the nut-splitters was doing nothing; the other three men were helping him or vice versa; the foreman couldn't tell by looking.

"Waiting on machine work," one of the nut-splitters explained.

"Well, see if you can't find something that needs doing while you're waiting," the foreman told them. "If you can't, there's plenty of running repair work."

"Martin was starting to bore the driving-boxes when I was in the machine shop," the machinist replied.

Evans went to the machine shop to see why the delay. He knew without looking.

LIKE many other roundhouses, the machine shop at Plainville is like a car with sticking brakes in a train. Not only does it retard progress, but it takes more power to keep the whole thing moving. Most of the machines are antiquated heirlooms. Good machines in their day, like Model T cars, but not exactly suited for present requirements.

The machines in the shop at Plainville were not installed, they were accumulated. Each machine in the building represents improvement made at some other shop. Some of them saw service at many points before finally being sent to plainville as the last step to the scrap car, like a homeless aged person sent to the poorhouse to wait for the final call.

There is one difference with the machines, they don't idly wait for the call of the scrap car. True they are idle much of the time while repairs are being made or waiting for new parts while stores department officials frantically search files for name and address of the manufacturer that years before built the machine. In many instances, the genealogy of machines is a closed book. Like that of Father Divine, no one knows from where they came. In such cases, replacement of worn out or broken parts becomes a costly, tedious process of manufacturing without proper facilities.

When Evans entered the machine shop, he found everyone busy as ants before a rain. Martin had one of the driving boxes centered on the face plate of the boring mill. The machinist was on his knees beside the machine. Judging by the expression on his face, he was praying for the boring mill to fall to pieces—very small pieces—and scattered where no one would ever find them.

"What's the trouble?" Evans asked.

"The damned clutch!—every time I try to take a cut it slips, then when I want to stop the machine it sticks," the machinist said.

"Get it going soon as you can. The boys on the drop-pit are waiting for them driving-boxes."

At the big planer, Morris was planing a guide, but not according to one definition of planing as given by the dictionary: "to make smooth ——"

Evans looked at the serrated surface of the guide. "No wonder cross-heads wear out so quick! That's rough enough to cut all the babbitt off before it's made ten miles."

Morris, thinking he was being criticized, spoke up, "Yeah, it's pretty rough, but I'd like to see anybody do a good job with this outfit."

"Maybe we'll get a surface grinder for finishing them some of these days," Evans told him, but without much assurance in his voice.

King, another machine hand, with the aid of a chain fall hung from a beam overhead, two laborers and a helper, was centering a piston and rod in an antediluvian eighteen-inch lathe. It was necessary to "gap" the lathe to accommodate the piston.

At another eighteen-inch lathe nearby, a machinist was making the cuttings fly from a brass bushing. Some of the gears in the lathe had worn out and had been replaced with ones made by hand by drilling and filing the teeth. Those gears represented many hours of painstaking labor, but the teeth didn't mesh accurately and the lathe sounded like a Shay locomotive coming in with its last load of logs.

A stack of brass castings flanking the lathe told how far behind the machine work was. Evans took a fresh chew and went back into the roundhouse.

The drop-pit gang was still stalling, waiting for machine work. Evans told them to pull the pistons out of the 5087 while they were waiting. "I'll be down and look them over when you get them out," he said.

"Say, Mr. Evans, the 5066 has got a crack in the diaphragm plate," Joe Lynch, a boilermaker, panted. "She's called," he added.

Evans scratched his head abstractedly, then turned and started towards the lower end of the roundhouse. He stopped at stall 17 by the side of the 5091.

"How's she coming?" the foreman asked the inspector who was looking the engine over.

"Not bad, several little jobs, and there's way too much lateral on the main drivers," the inspector replied.

"Tell Carter and Cox to start working her. Got to use her right away in place of the 5066."

Evans checked the lateral between the wheel hub and driving-box of the left main driver. He shook his head and went to the other side. Hope vanished at first glance. He didn't need a scale to see that running the locomotive with that amount of lateral was nothing less than a bid for a Form-5 if a government inspector caught it—and the inspector assigned to that district must be a seventh son of a seventh son. If not clairvoyant, he's mighty accurate reading the present when it comes to Federal defects on locomotives.

Form-5's are about as welcome on the S. P. & W. as red ants at a picnic. They should be white instead of pink, because when a foreman gets one it makes him feel blue; when the master mechanic gets through telling him, his face is red, and everybody concerned gets "Hail Columbia" from the higher officials.

Evans was in a predicament. There was no other engine available for the fast fruit train and he didn't want to take too much of a chance.

Suddenly he turned and headed for the babbitt shop between a run and a walk. A pot of molten metal was bubbling on the fire. The babbitt man was getting ready to pour some cross-heads. He was testing the temperature by dipping a smooth pine stock in the hot metal when the foreman came in.

"How is it?" Evans asked. "About hot enough to pour?"

The babbitt man looked at the stick. "Just about."

"Get a piece of one-inch hose five or six feet long and bring a big ladle of metal down to the 5091. Tell Malone I said to help you. Have the babbitt good and hot."

"What you want us to do?"

"I'll be down there," Evans told him and went to the roundhouse office to tell the clerk to call the dispatcher and give him the change of engines on the fruit train.

Evans was waiting on the right side of the 5091 when the coppersmith and babbitt man got there. Malone, the coppersmith, was an old head and had an idea of what the foreman wanted done.

"Which one is it?" he asked.

"Right here," Evans replied. "Be sure the hose fits up good and snug. . . . Help him hold it in place," he told one of the machinists, "and put on your goggles."

When the hose was drawn up in place to close the outside of the gap between the hub and driving-box, Evans told the babbitt man to fill the space with the molten metal to take up the lateral on the right side. There was still enough lateral on the left side.

When cooled enough to set, the babbitt appeared to be stuck solid to the polished outside end of the main driving-box. A little chipping with a chisel smoothed the rough edges of the metal.

"Well, I hope it makes a trip without falling off," Evans said fervently when the job was finished and the hostler started backing the 5091 out of the house.

THERE wasn't anything called to run for a couple of hours. Evans went back to the office for a few minutes rest. While resting he could look over work reports, sign some requisitions for material, figure out the engine lineup, and read any mail that had come in.

The correspondence on his desk wasn't heavy, but it was hot. One letter in particular from the master mechanic quoting the superintendent of motive power intimated that from the number of bull rings used at Plainville they must think bull rings were bought at Woolworth's with special consideration for quantity. He further suggested that just because brass was yellow no one need think it came in bunches like bananas.

While the foreman was reading the mail, one of the machinists that had been working on the 5087 came in. "We've got the pistons pulled," he told Evans.

"How do they look?"

"Blowing pretty bad. Both sides will need new bull rings and the cylinders should be rebored; they're considerable out of round."

The cylinders were out of round, no denying that. Evans knew it before he calipered them. New bull rings would only correct the trouble temporarily.

"Well, you fellows go back to the drop-pit. Martin should have the driving-boxes finished by now."

Evans found machinist Cox and told him to bore the cylinders on the 5087.

The nut-splitter groaned and began to gather up his tools. Martin came by holding a pair of calipers like he had something on a stick that didn't smell good.

"How in the dickens can a man make bushings to fit when the pin and hole in the rod are as bad out of round as that?" The nut-splitter pointed with his thumb over his shoulder.

"What engine?"

"The 2768—main pin. I've made a new bushing every trip for the past two months and they come back pounded out," Martin said. "If we had a crank pin grinder ——"

"Yeah, I know," Evans interrupted. "If the pins were true, bushings would run better and last longer, but I don't see much chance of us getting a pin grinder; they cost a lot of money."

Evans felt like saying more. He felt like saying that pin grinders cost money, but so do bushings, and the labor putting them in adds up, to say nothing of delays caused by hot pins. Burning out worn pins and replacing them with new ones cost money too, especially with the facilities for doing it at plainville. Heating the wheel hanging a ram in place, an occasional miscalculation of expansion with a new pin sticking and having to be burned out—Evans thought of all that as he walked down towards the 5087.

Cox and his helper had with the help of two laborers lugged the cumbersome boring bar down to the locomotive and were setting it up. The helper had gone in search of an air motor while Cox centered the bar in the left cylinder. They were getting along as well as could be expected. The foreman went on through the house.

It was mid-afternoon when Cox got the boring bar all set and ready for the first cut in the cylinder.

Cox is about the only machinist in Plainville that has any luck with the old boring bar at all and sometimes he has a lot of trouble. The front end support has been broken and welded on one side and requires a washer of just the right thickness under it to line up. Hay wire is used to stay the air motor that runs the machine. When set up, the outfit looks like something Rube Goldberg might have constructed and works very little better.

Cox turned on the air; the bar started to turn. The feed wouldn't work. It took thirty minutes of tinkering and cajoling before the recalcitrant feed decided to cooperate and the cut was started. The tool bit into the metal; the air motor stalled. The machinist gave it a twist with his hand to start it again. That time it kept going, the tool chattering its way through. Evans came by and watched a few minutes.

Ten minutes later the air motor operating the boring bar quit cold. About that time the stationary fireman came in. He was looking for Evans. "The air compressor—it's broke down," the stationary fireman told the foreman.

Evans swore under his breath. "I don't see how they expect us to keep locomotives running with machines that need more work on them than the locomotives," he growled.

"What am I going to do about boring the cylinders?" Cox wanted to know.

"How you getting along?"

"A finishing cut will finish the left one."

Evans squinted one eye thoughtfully. "Well," he said, half to himself, "tell the hostler to run the 5074 in the stall next to the 5087. Use air from her reservoir to finish the left cylinder with. Better work overtime to finish it."

"What about the right one?"

"Let it go. We'll put in a new bull ring and packing. It'll run a few trips."

It would run a few trips—blamed few—and there'd be more letters "why so many bull rings, why so much valve oil, why so much overtime, why didn't locomotives make time with full tonnage." Evans knew it, but—locomotives have to run, so what the hell ——

Evans went to the storeroom to see if they had plenty of bull rings and bushings ordered.

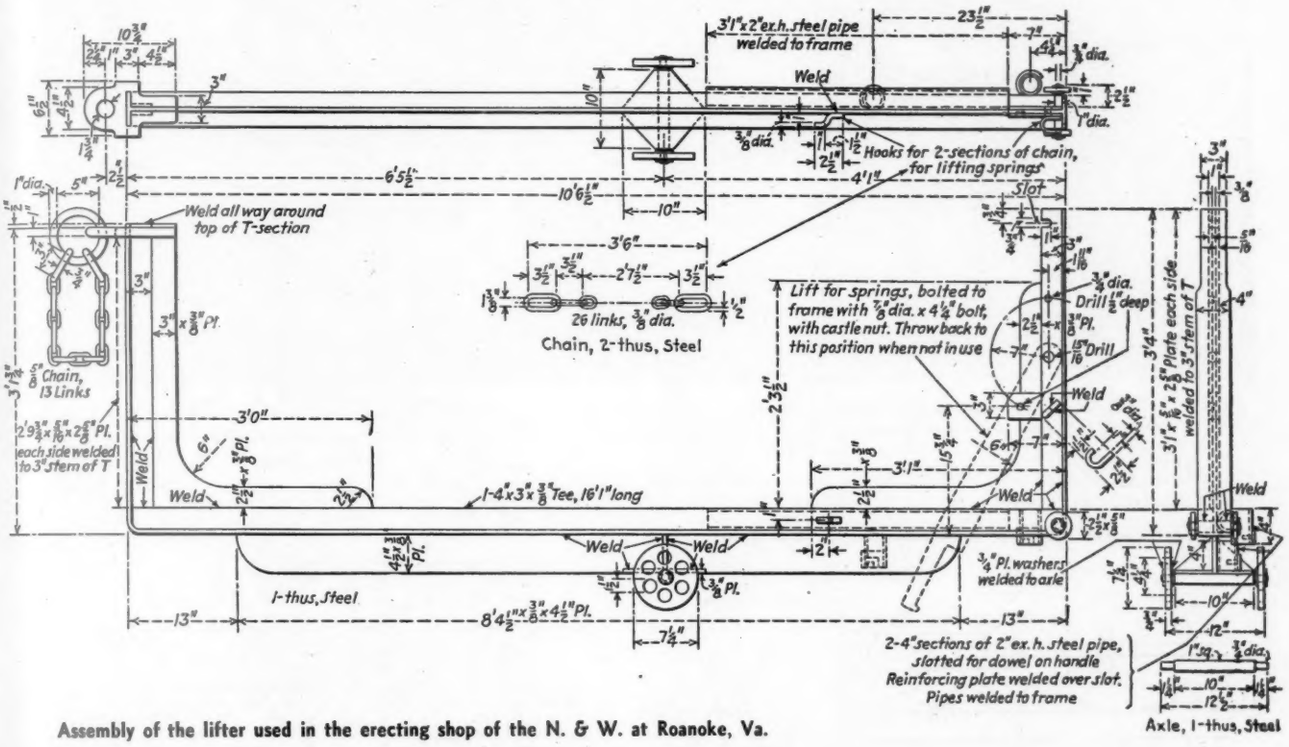
Combination Lifter for Locomotive Parts

A lifter incorporating a number of various attachments which can be slipped onto the device is being used in the erecting shop of the Norfolk & Western at Roanoke, Va., for removing and applying such locomotive parts as driving springs, expansion joints, high-pressure crossover steam pipes, stoker parts, cylinder heads, grate-shaker cylinders, lift shafts, valve-gear frames, power reverse gears, crossheads, and crosshead guides. The drawings show the lifter and nine of the various attachments, from which it will be noticed that the attachments can be quickly applied and removed. Other illustrations show the device in use. A handle made of pipe, which can be inserted and locked in either of two sockets in the back of the upright member of the lifter, is used to guide

the device. Wheels on the back of the upright member facilitate the rolling of the lifter about the shop without the aid of a crane.

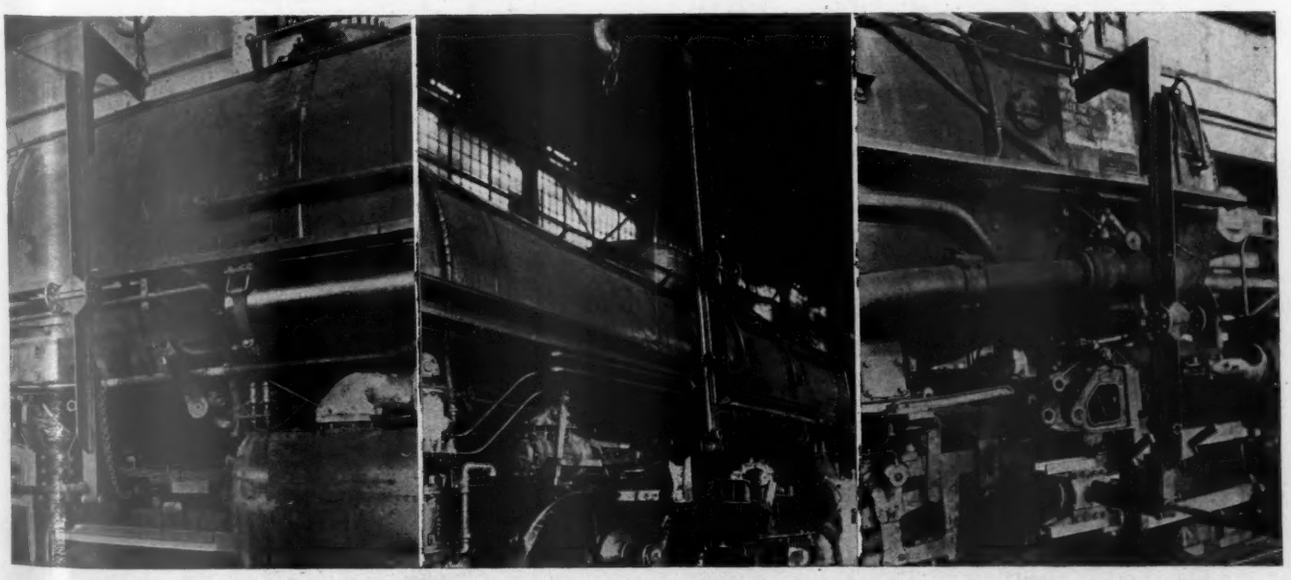
Attachment No. 1 is used for lifting Ragonnet power reverse gear. Attachment No. 2 is for lifting front cylinder heads, line shafts, crossover steam pipes, high-pressure steam-pipe elbows, and with an extension added is used for applying fire doors and stoker parts. Attachment No. 3 is for applying back cylinder heads. Attachment No. 4 is used for applying steam-pipe expansion joints.

Attachment No. 5 is for lifting driving springs, trailer springs and crosshead guides; this attachment is bolted to the lifter as shown in the assembly drawing of the device and can be turned back to permit the application of other attachments. Chains are used with attachment No. 5 for swinging driving springs under the lifter so that the springs can be hoisted over driving wheels. Section *AA* of attachment No. 5 shows a locking device to hold the attachment in or out of position when on the lifter.

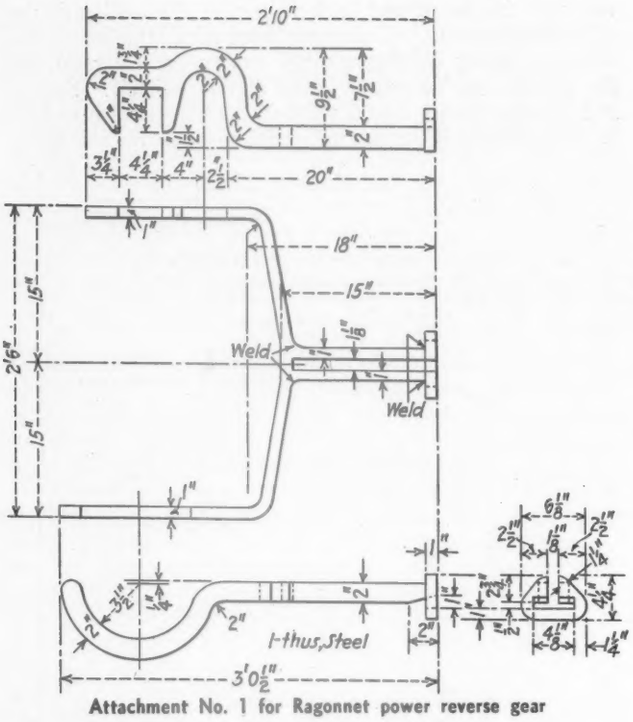

3'1"x2" ex. h. steel pipe welded to frame
Weld
Hooks for 2-sections of chain, for lifting springs
Slot
Weld all way around top of T-section
26 links, 3/8" dia.
Chain, 2-thus, Steel
Lift for springs, bolted to frame with 7/8" dia. x 4 1/4" bolt, with castle nut. Throw back to this position when not in use
Drill 1/2" deep
Plate each side welded to 3" stem of T
1-4"x3"x3/8" Tee, 16'1" long
1-thus, Steel
3/4" Pl. washers welded to axle
2-4" sections of 2" ex. h. steel pipe, slotted for dowel on handle
Reinforcing plate welded over slot.
Pipes welded to frame
Axle, 1-thus, Steel

Assembly of the lifter used in the erecting shop of the N. & W. at Roanoke, Va.

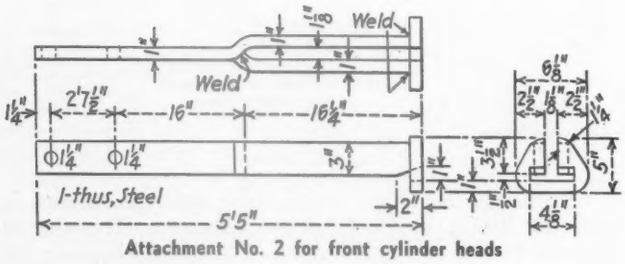
Attachment No. 6, of which there are two designs, is used for lifting Baker valve-gear frames. The slot at the end of the horizontal arm of the lifter is used for holding the No. 6 inside attachment in position. This slot is also used for blocking up spring-lifting attachment No. 5 by placing a bolt or other round stock in the slot under this attachment, thus raising it high enough to remove and apply driving springs behind valve-gear



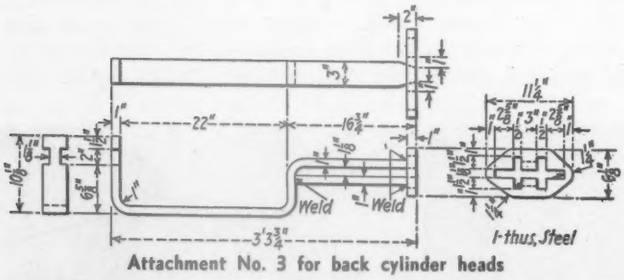
Left—Spotting a driving spring in position with attachment No. 5. Center—Ragonnet power reverse gear being applied with attachment No. 1. Right—Lifter with no attachment being used for applying a crosshead



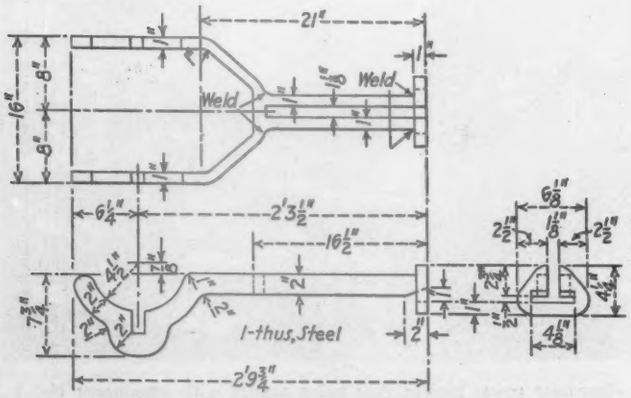
Attachment No. 1 for Ragonnet power reverse gear



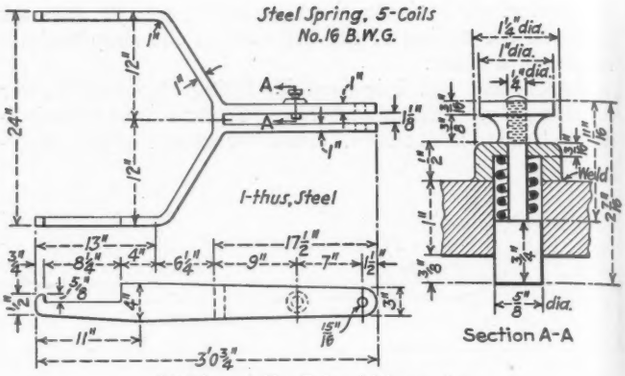
Attachment No. 2 for front cylinder heads



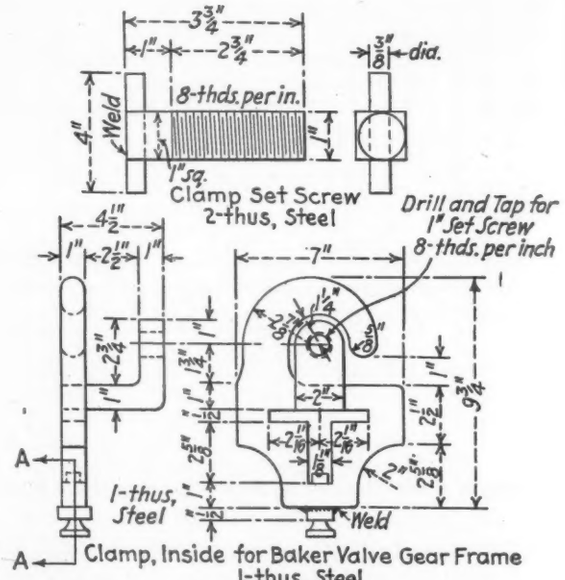
Attachment No. 3 for back cylinder heads



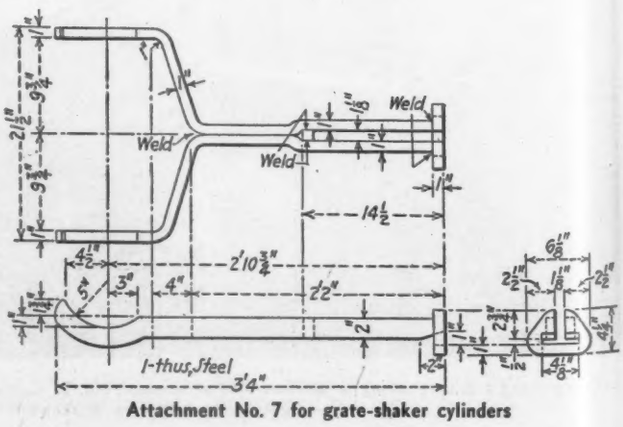
Attachment No. 4 for steam-pipe expansion joints



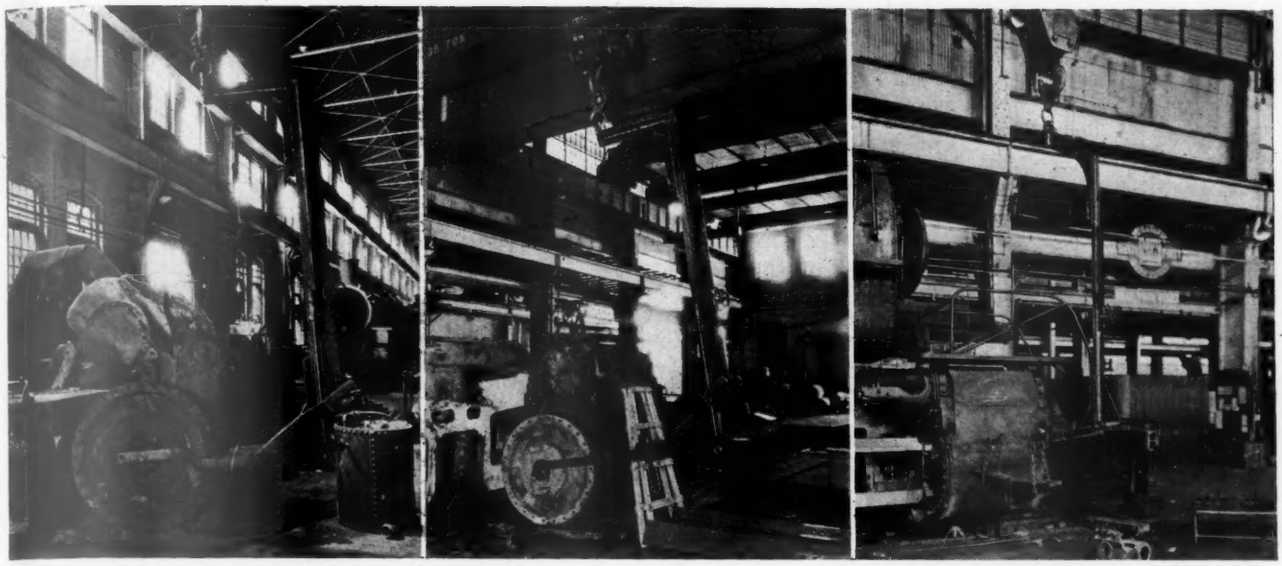
Attachment No. 5 for driving springs



Attachment No. 6 for Baker valve-gear frames—See attachment No. 5 for details of section *AA*



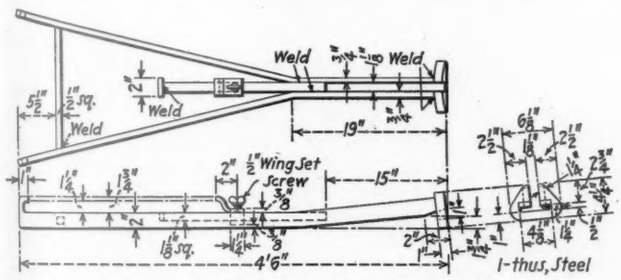
Attachment No. 7 for grate-shaker cylinders



Left—Front cylinder head being handled with attachment No. 2. Center—Front cylinder head being applied with attachment No. 3. Right—Lifter with attachment No. 5 carrying a driving spring suspended on chains for placing it behind a driving wheel

frames. A locking device used with this attachment, shown as Section *AA*, is the same as illustrated in the drawing of attachment No. 5.

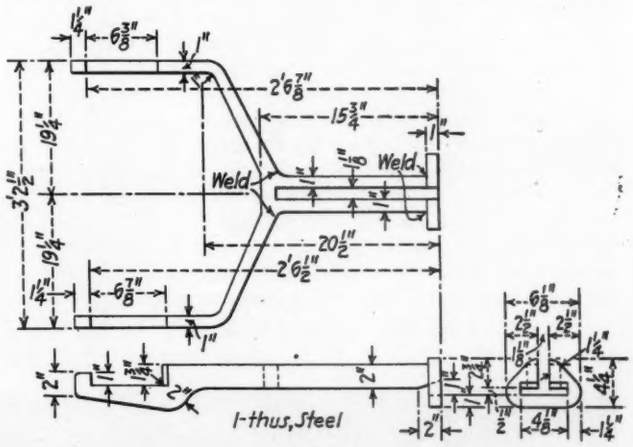
Attachment No. 7 is for lifting grate-shaker cylinders,



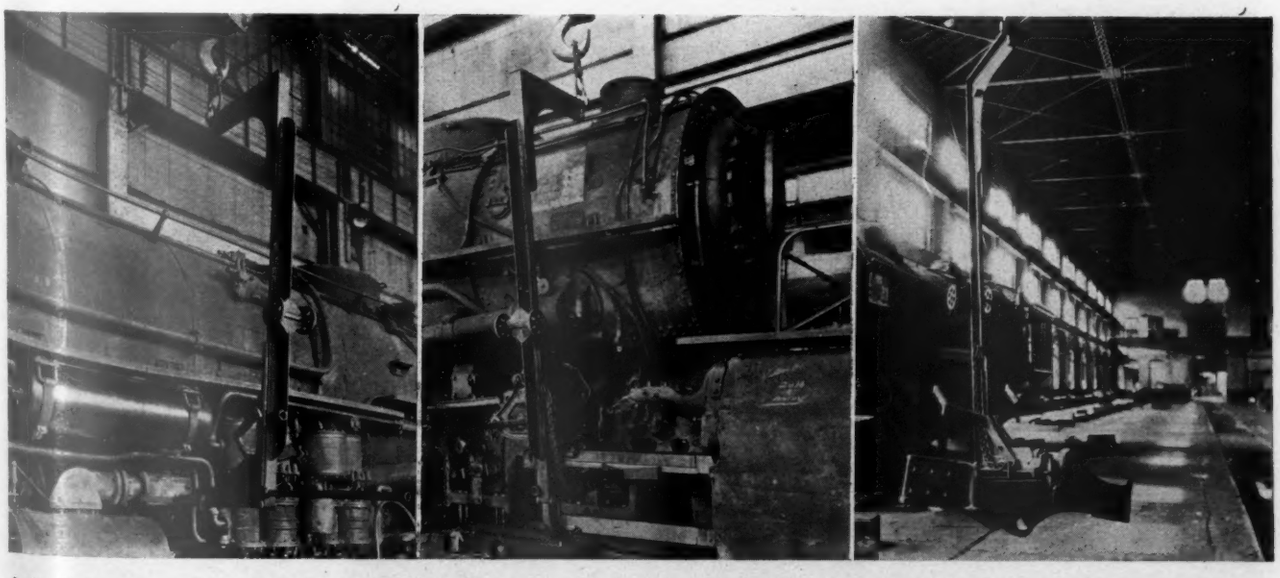
Attachment No. 8 for smoke-stack extensions

attachment No. 8 is for lifting smoke-stack extensions and attachment No. 9 is for handling the cylinders of Precision power reverse gears.

When applying or removing crossheads, as shown in one of the illustrations, no attachment is used with the



Attachment No. 9 for Precision power reverse gear



Left—Steam-pipe expansion joint being handled with attachment No. 4. Center—Applying a crosshead guide with attachment No. 5. Right—Baker valve-gear frame held on the lifter by attachment No. 6. Note attachment No. 5 swung back out of position

lifter, the horizontal member being inserted directly into the wrist-pin hole. In this view the guide handle is seen inserted in the lower socket; the upper socket for the handle is shown just below the wheels on the back of the upright member of the lifter.

All of the attachments slip on the lifter, and where necessary are held in place by locking devices shown in the drawings of attachments Nos. 5 and 6. The uses of attachments Nos. 1, 2, 3, 4, 5, and 6 are shown in the various illustrations. Uses of attachments Nos. 7, 8, 9, and 10 are not illustrated, but the captions of the drawings indicate their use. The lifter takes up very little space on the shop floor and can be readily moved about the shop by means of the wheels without the use of a crane. It has proved to be valuable in the erecting shop on the N. & W. as a safe and economical device for handling locomotive parts.

Arch-Tube Bushing Reamer

The arch-tube bushing reamer or facing tool, illustrated, is used at the Alliance, Neb., shops of the Chicago, Burlington & Quincy to save time and money and eliminate delays when arch-tube plugs leak. By the use of this tool, it is possible to refinish badly-pitted and leaking arch tube bushing seats smoothly, accurately and with a minimum out-of-service time for the equipment.

A tap *A* should be on hand or made to clean out boiler scale in the arch-tube bushing before applying the expanding nut *B*. Then screw the expanding nut into the arch-tube bushing and be sure it is about three threads below the face of the bushing so that the cutter will not cut into expanding nut and damage it. Next apply the hollow threaded taper plug *C* (⅞ standard USS thread inside) and then the dowelled barrel wrench *E* which is used, in connection with a spanner wrench, for holding the expanding unit in place while a long-handle socket wrench is applied to tighten the taper plug. After this is done, remove the dowelled barrel wrench and apply

Parts of the arch-tube bushing reamer used in reconditioning bushing seats

the reamer *D*, a ⅞-in. by 6-in. stud or bolt being used to guide and tighten the reamer while operating.

For best results use a little cutting fluid while reaming and also keep the reamer sharpened to a keen edge. If necessary, a blank reamer may be substituted for the cutting reamer and the joint ground to a very smooth seat. In the illustration, the assembly of wrenches required to operate this reamer is shown below the various reamer parts.

* * *

Whiting Jacks Used in Tank Shops

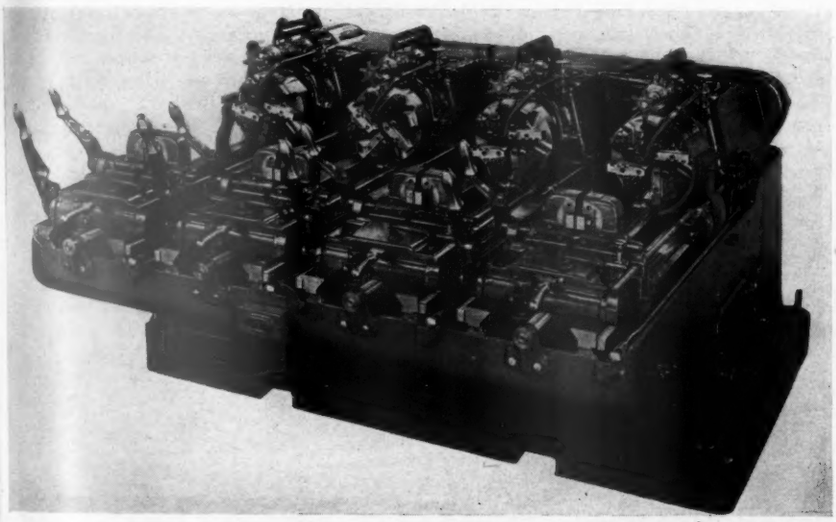
Whiting electric portable jacks have been used for years in sets of four at coach shops to raise cars for truck removal and application where cranes of sufficient capacity were unavailable, or where low roof height made the use of any traveling crane impractical. In the past few years single pairs have been utilized at coach yards to take the place of drop-pit tables when removing and applying trucks or single pairs of car wheels.

A more recent application of the jack is shown in the illustration, where a set of four units are used in a tank shop for raising heavy rectangular and Vanderbilt-type tenders. Since capacities, in sets of four, run from 100 to 140 tons, these jacks can easily handle these modern tenders. One jack, a pair, or two pairs can be operated from a single control station. These jacks also are in successful use handling electric locomotives for wheel removal, and but minor changes were necessary to make them applicable for their present use in locomotive shops. With present construction they can be used for raising Diesel-electric locomotives for truck removal.

NEW SHOP TOOLS AND APPLIANCES

Four-Head Staybolt Threading Machine With Tangent Dies

The illustrations show the Model 35 four-spindle staybolt threading machine developed by the Acme Machinery Company, Cleveland, Ohio. The machine is equipped with Acme tangent dies which are supported against the cutting action almost to their center line, this design being used to insure uniform and accurate diameters through the entire length of the thread. An adjustment feature operated by a star wheel, shown above the heads, is used to set the dies for different diameters of staybolts; this adjustment has a diameter range of 3/8 in. without stopping the rotation of the spindle. A dial graduated in thousandths of an inch directly behind the star wheel permits quick adjustment for accurately sizing diameters.

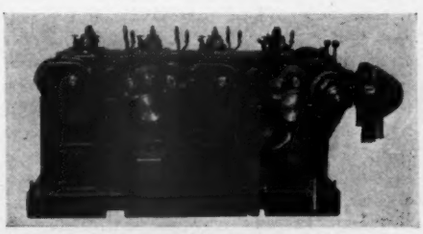


The Acme Model A four-spindle staybolt threading machine

The machine is equipped with an eight-speed quick-change gear box which is clutch controlled. All gears and shafts are of alloy steel mounted on preloaded Timken bearings running in oil. The vises can be adjusted in both directions, which feature permits lining up the staybolt with the center of the spindle. Other features of the machine include: A power-feed attachment; leadscrews to all spindles; a pitch indicator; double racks and pinions for actuating the carriages through an 18-in. travel; self-contained motor drive which is optional either through a silent chain or a multiple V-belt; hand and automatic trips to both die-head and leadscrew nuts; covered ways; telescopic cover over leadscrews; an automatically reversible coolant pump. Another feature of the machine is that both the bed and headstock are made from fabricated steel plate which does not change the contour over that of a casting.

The machine can be used for threading staybolts from ½ in. to 1½ in. in diameter at spindle speeds of 49, 62, 81, 102, 122, 152, 200, and 250 r.p.m. Power is furnished by a 7½-hp. motor which operates at 1,750 r.p.m. The machine weighs 8,000 lb. and occupies a floor space 80 in. by 82 in.

The Model 35 machine is designed specifically for production work, inasmuch as the independently operated die heads are so arranged that one or more are in operation while the vises or chucks of the others are being loaded. All controls, including those for making speed changes, are located to facilitate production work. An index placed on the front of the headstock indicates the proper position of the levers to obtain the desired machine speeds.



Rear view showing drive units of the Acme staybolt threading machine

The Acme tangent die heads with which the machine is equipped can be adjusted by means of the star wheel above the headstock for controlling the size of thread diameters. On coarse-pitch threads where two or more cuts are required, the adjustments for the various diameters can also be made without stopping the machine. The graduated scale at the top indicates the exact position of the dies for the operator.

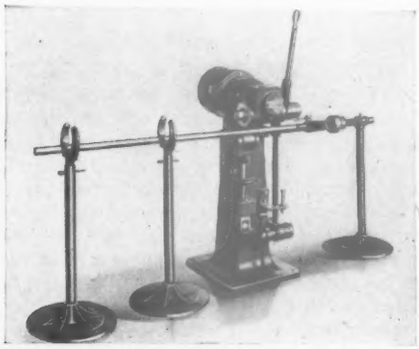
The die head is made up of a die ring, a barrel, a die slide, a die holder, a gage for setting dies, a die, and a die adjusting block. The die opening movement is radial and, on completion of the threading operation, the die is released radially from the cut without chip interference. The barrel supports the die, without overhang, almost to its center line. This construction makes for head rigidity and prevents the dies springing open on heavy cuts and eliminates one cause of inaccurate work. The die slide is a hardened tool-steel forging, accurately ground, operating in long hardened tool-steel bushings in the die rings and between the hardened and ground plates in the die barrel.

Upright Roller Pipe Cutter

A roller pipe cutter has been placed on the market by the Murchey Machine & Tool Company, Detroit, Mich., for cutting lengths of ½-in. to 2-in. pipe on a production basis. The machine, designated as the Murchey Model F pipe cutter, incorporates features of modern machine-tool design including a thin heat-treated steel cutting wheel capable of cutting off seven hundred 1 in. or twelve hundred ½ in. nipple blanks per hour. The cutter shaft of the machine is always in a fixed position and the rollers which support the pipe are raised to the revolving cutter by a combination hand and foot lever to save time and increase output. An adjustable stop is provided to limit the motion of the lever and pedal when cutting short pieces which do not require a full cycle of the cam which raises the roller cage to the cutter wheel. The rollers are of hardened tool steel and revolve in internal roller bearings. The cutter shaft is hardened and ground, and runs in Timken preloaded roller bearings. A gage bar for regulating lengths of nipples or pipe is supported by the column of the machine. This gage bar can be clamped to insure uniform length of nipples and is adjustable for all pipe sizes and all lengths within the ½-in. to 2-in. range of the machine. As an extra, a cage of smaller rollers can be fur-

nished to give the machine an added capacity for cutting ⅛-in. to ⅜-in. pipe. This cage of rollers can be placed in position without removing the standard roller cage used when cutting ½-in. to 2-in. pipe.

The machine is designed primarily as a motorized unit using a 2-hp. 1,200-r.p.m.



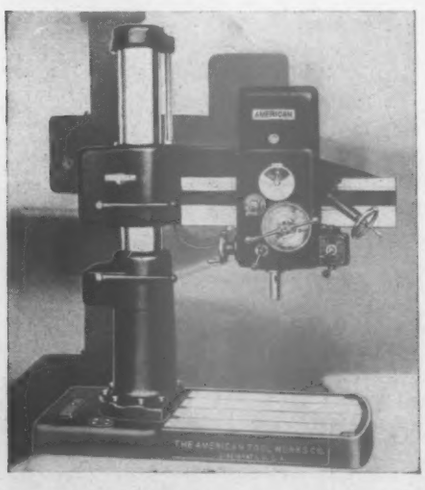
The Murchey Model F pipe cutter

motor mounted as an incorporate part of the machine with a direct drive to the cutter wheel; however, it can be furnished with cone pulleys for belt drive. The motor driven unit weighs 883 lb. and occupies a floor space of 20 in. by 20 in. Standard equipment consists of the previously mentioned standard rollers, one cutter wheel, a length gage, a gage stand, and three pipe stands. The machine is so designed that all roller cages, pipe stands, gages, etc., are interchangeable with the Murchey Model E pipe cutter.

Radial Drill For Precision Work

The illustrated drill, recently developed by The American Tool Works Company, Cincinnati, Ohio, and known to the trade as the "Hole Wizard" is designed for high-speed drilling, tapping, boring and facing operations. Accurate boring and facing is accomplished with the aid of stabilized spindle construction. The drive to the spindle is by means of hardened and ground helical gears. This provides a smooth power transmission to the spindle and a very quiet drive even at the highest spindle speeds. The spindle and spindle sleeve are made of Nitralloy steel, nitrided for extreme surface hardness. The spindle is ground to close limits and the sleeve is honed to precision limits. The hardening of these members permits of a much closer fit between the two, resulting in a precision mounting that lends itself to the most accurate drilling and boring for toolroom operations, die making and jig boring. The driving sleeve is mounted on Timken bearings at the top and bottom with means for take-up in case of wear. This insures not only a drive free from friction, but one whose original accuracy can be maintained for many years.

The Hole Wizard is offered in 3 ft. and 4 ft. sizes and in 9-speed and 12-speed types. It is driven by a built-in, high reversal, shell-type motor on the head and is equipped with a 9-in. diameter column.



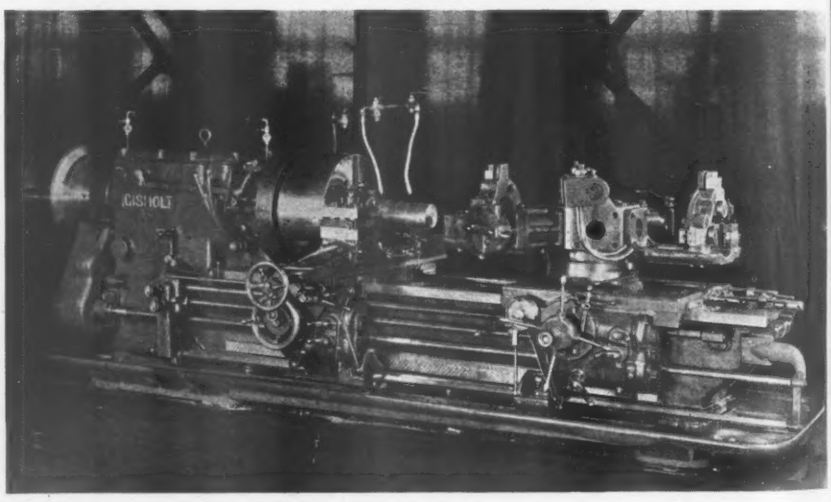
The American "Hole Wizard" radial drill

Machining Locomotive Crank Pins On a Turret Lathe

Machining crank pins, wrist pins and knuckle pins for locomotives is the work performed by the 4L heavy-duty turret lathe built by the Gisholt Machine Company, Madison, Wis., which is equipped with double hydraulic chucks and a fixed-center hexagon turret. Crank pins turned from forged alloy-steel bar stock can be machined at a cutting speed of approximately 60 ft. per min. when using high-speed steel tools and a cutting lubricant. The bar stock is held in two hydraulic chucks, one mounted on each end of the spindle. A three-jaw chuck is mounted on the rear end of the spindle and a six-jaw Duplex chuck on the front end. This chuck is really two three-jaw chucks built into one body with one set of three jaws located on the front face and the other set mounted in the chuck body near the back face. When the bar is too short to be held in both chucks, all six jaws in the chuck are used to hold the bar securely for machining. In this way the entire bar is used with a minimum amount of stock required for chucking purposes when machining the last piece in each bar. The duplex feature of the front chuck aids materially in chucking the short piece for the second machine operation described later.

Gisholt hydraulic chucks are adapted to this type of work because their design does not obstruct the spindle bore. Constant pressure to the jaws is another feature of the chucks because if the jaw teeth sink into the bar stock, the jaws automatically follow up, maintaining their grip on the bar and prevent slippage.

Crank pins, 7 in. in diameter and 14 in. long, are machined in two groups of operations. The order of machining in the first group is as follows: First, the bar stock is drawn forward to the desired distance by a bar gripper on one of the turret faces; second, all diameters are rough turned straight with a multiple-cutter turner which holds three cutters that cut simultaneously; third, the end is centered with a centering tool on one of the turret faces; fourth, two tapers are turned at the same time with the multiple-cutter turner; fifth, the end is faced and the small end is necked down before cutting off; sixth, the pin is cut off and caught in the bar carrier on one of the turret faces. The time for these six operations is less than 45 min.

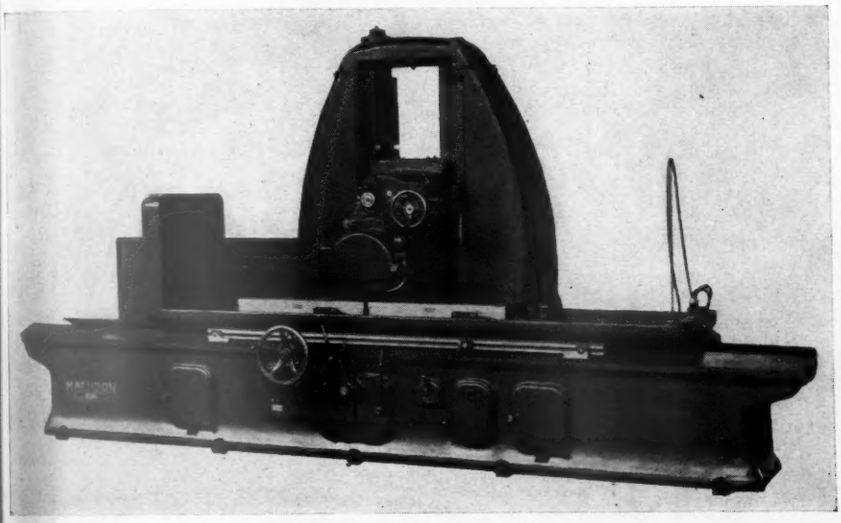


Gisholt 4L high-speed turret lathe equipped with double hydraulic chucks and fixed-center hexagon turret

The order of the second group is as follows: First, chuck the pin on the straight diameter with soft jaws in the duplex hydraulic chuck; second, finish turn the small diameter and finish face with the square turret tool post; third, thread with a self-opening die head; fourth, drill a hole approximately 7 in. deep, counterbore, and tap, using a quick-change drill chuck on the turret face. The second group of operations is completed in less than 25 min.

Precision Surface Grinders

The Mattison Machine Works, Rockford, Ill., is now offering the Mattison surface grinder with table widths of 12, 14, 16, 20 and 24 in., table lengths of 3, 4, 5, 6, 7, 8, 10 and 12 ft., hydraulic table feeds varying from 30 to 100 ft. per min., a built-in motor mounted directly on the driving wheel spindle, and two massive columns which support the wheel slide assembly without overhanging. The wheel head on all sizes of the grinder can be adjusted vertically to allow 16 in. between the table surface and the grinding wheel, which is 16 in. in diameter. The table has T-slots for holding the work on the table or for applying a supplementary table, special fixtures, or a magnetic chuck. The accompanying table lists floor spaces occupied by each of the machines. The five sizes of grinders all have grinding wheel guards, a wheel sleeve, a splash guard, base-leveling wedges, and a diamond tool holder furnished without a diamond.



The Mattison precision surface grinder

The motor of the 12 in. and 14 in. sizes has a rating of 15 hp. and can be furnished for alternating current of 220, 440 or 550 volts and operates at 1,200 r.p.m. on 40- or 60-cycle current and at 1,500 r.p.m. on 25- or 50-cycle current. The hydraulic, coolant and lubricating pumps for the 12 and 14 in. grinders are driven by a 5 hp. motor. The motor used for raising and lowering the wheel head has a rating of ½ hp. All motors are totally enclosed for protection against oil, water and metal dust. The wheel-spindle and pump motors are operated from a single push-button control station. The machine is equipped with a 30 gal. coolant tank, and the pump has a capacity of 20 gal. per min. The 16-in. grinding wheel has a 6-in. face, and a 5-in. hole, but can be furnished with a 10-in. hole. The cross-feed control is arranged for either hydraulic or manual operation; the transverse wheel-feed can be varied up to 1½ in. at each reversal of the table.

The motor of the 16, 20 and 24 in. grinders has a rating of 25 hp. and can be furnished for the same voltages and currents for speeds of 1,200 and 1,500 r.p.m. as specified previously for the 14 and 16 in. grinders. The hydraulic, coolant and lubricating pumps are driven by a 7½ hp. motor, while the one used for raising and lowering the wheel head has a rating of ¾ hp. The coolant tank with these three sizes of grinders has a capacity of 40 gal. and the pump has a capacity of 30 gal. per min. The wheel-spindle and pump motors are operated from a single push-button control station. The 16-in. grinding wheel has a 6 in. face and a 5 in. hole but can be furnished with a 10 in. hole if desired. The cross-feed control is arranged for either hydraulic or manual operation; the transverse wheel feed can be varied up to 1¾ in. at each reversal of the table.

Operating and adjusting levers, hand wheels, and electrical push buttons and switch levers are located on the front of all the machines, within reach of the operator. Raising and lowering the grinding wheel is controlled electrically by a push button located in the end of the clutch lever. With one movement, the motor is started and the power clutch is engaged. The downward movement of the wheel is controlled by a separate push button which is so arranged that the travel continues only while the operator keeps the button depressed. This enables him to spot the wheel just above the work. Final adjustment for grinding is made by handwheel and stop with micrometer graduations of 0.0001-in.

The reversing of the wheel-slide traverse is accomplished automatically, both on hand and hydraulic feeds, by two dogs on a circular disc and located directly in front of the operator. This mechanism also serves as a means for locating the wheel in the center of the work. The automatic feed can be disconnected and the hand feed used for shoulder grinding. A micrometer cross-stop device for positive regulation of the wheel movement can be furnished as extra equipment.

Floor Space* of Mattison Surface Grinders

Table travel, ft.	Table width: 12 and 14 in.	16 in.	20 in.	24 in.
	Floor space, ft.–in. × ft.–in.			
3	5–10 × 10–0	.....	.....	.....
4	5–10 × 12–0	.....	.....	.....
5	5–10 × 14–0	.....	.....	.....
6	.....	7–6 × 18–6	7–10 × 18–6	8–8 × 18–6
7	.....	7–6 × 20–6	7–10 × 20–6	8–8 × 20–6
8	.....	7–6 × 22–6	7–10 × 22–6	8–8 × 22–6
10	.....	7–6 × 26–6	7–10 × 26–6	8–8 × 26–6
12	.....	7–6 × 30–6	7–10 × 30–6	8–8 × 30–6

* Including extreme travel of table at both ends.

Sawing Machine With Selective Speeds

Another model of "Doall" contour sawing machine, just placed on the market by Continental Machine Specialties, Inc., Minneapolis, Minn., incorporates a dual dial control for indicating correct cutting speeds of various materials. The most important factor in narrow-band contour sawing is the correct speed of the saw for each material and for each thickness of job. To cut high-chrome, high-carbon steel the saw must travel at the rate of 50 to 75 ft. per min. To cut aluminum

Doall machine for selective narrow-band contour sawing of different metals

castings the saw must travel 400 to 500 ft. per min. Each different thickness of work and each different material necessitates a different sawing speed. The same is true in filing or polishing when the Doall machine is used for these functions.

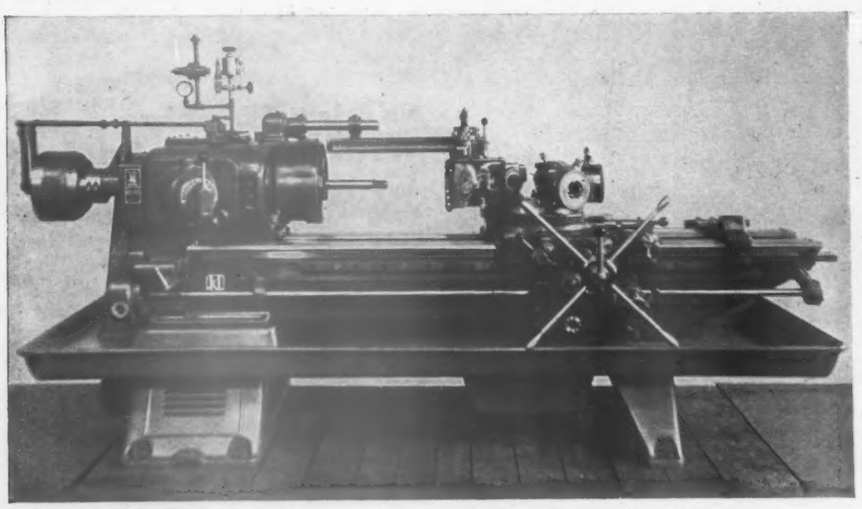
A dual-control dial is now built into the Doall machine, being mounted on the hinged door which is a feature of the model. After the manner of radio dial selections this dial lists 48 different materials. They are arranged alphabetically around the rim of the dial, beginning with aluminum and ending with zinc. This list includes several trade-marked materials, such as Monel metal, and, of course, all the common metals and materials. There is one blank space on the dial to permit the listing of any special material developed in the future.

In addition to dialing the correct sawing and filing speed, this control also translates the correct saw to use for each material. That is, it also shows the correct selection of saw as to pitch, temper and set for each of the 48 different materials.

Other improvements in this Doall contour machine are an improved lap grinder, a wider adjustment in the saw guide, and greater ruggedness throughout.

Machining Locomotive Tapered Bolts on a Production Basis

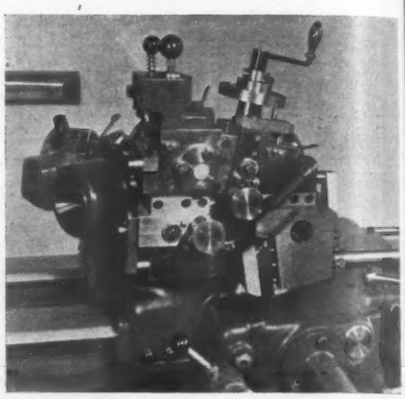
After analyzing methods for turning tapered locomotive bolts, the Jones & Lamson Machine Company, Springfield, Vt., has developed its turret lathes and tools to produce these bolts on a production basis. The unit developed for this purpose is the illustrated Jones & Lamson taper-bolt machine equipped with an air-operated three-jaw chuck for gripping the bolts on the hex head, a bell pointing tool, a taper turner for turning taper and straight diameters, and three automatic die heads which cover the majority of thread sizes on tapered frame bolts. The turret tools are arranged for three machining operations: First, the Bell pointing tool is used to square the end and point the bolt for turning; second, the taper turner is used to turn the body of the bolt, butt face the head, and turn the threaded portion straight to the desired thread diameter; and third, one of the three automatic dies is set to cut the required thread diameter.



The Jones & Lamson turret lathe for turning tapered locomotive frame bolts

The taper turner that is included with the machine will turn straight or taper diameters. The turner operates as follows: First, it is adjusted to a master plug which makes it possible to set the two supporting rolls and the tool in correct relation to one another. Second, the large graduated dial is set at zero, and to turn various sizes the operator opens or closes the turner to the desired size by reading the graduations on the dial. This makes it possible for the machine operator to turn bolts, on a production basis, to fit the reamed holes.

The taper is controlled with a template which can be made adjustable or solid. The taper template controls the two supporting rolls and the tool, so that, as the tool travels up the taper, all three points open up according to the adjustment of the taper template. With this turner it is possible to turn tapers the same as you would turn a straight diameter with a standard roller turner or box tool. The two supporting rolls follow the tool and produce a rolled finish. The template can be disengaged while the turner is at any point on the work for turning straight portions of the bolts.



The turret head of the J&L lathe—The Bell pointer is shown at the left, while the cutting tool and rolls are shown in the center

After the bolts have been removed from a locomotive frame, the holes are reamed until they clean up. No attempt is made to ream the holes to the same size. A taper plug gage is used for measuring the holes after they are reamed. The taper is ⅛ in. per ft. so that it is possible to obtain an accurate reading of the large end of the hole. The plugs are all lettered according to size and graduated from 1 to 10.

A chart, shown in Table I, is used for translating the reading on the plug gage to a decimal dimension so that the machine operator can turn a bolt to fit the hole that has been reamed and gaged. As an illustration, if the hole is measured with plug *A* and it drops into the hole to line *8* the decimal size of the bolt adjacent to the head should be 1.100 in. to obtain the necessary drive fit. It has been found in practice that the operator can disregard the small end of the taper and

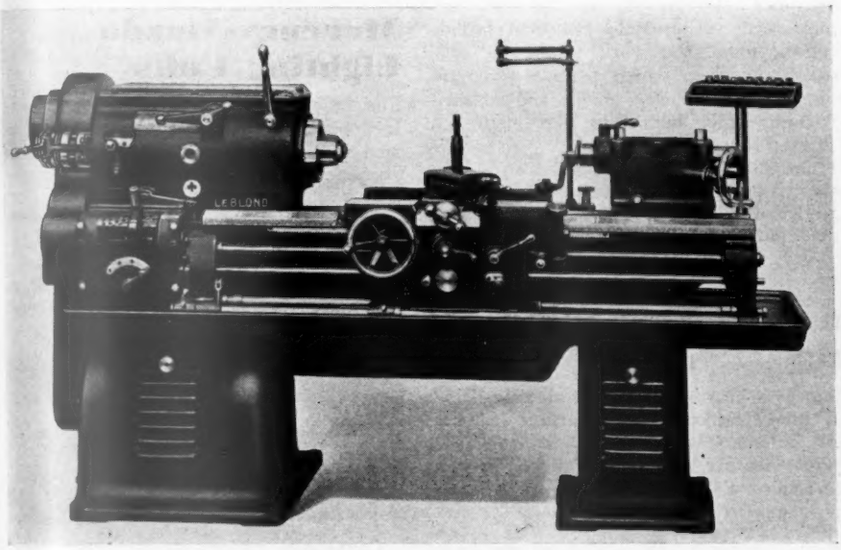
Table I—Plug Gage Classification and Limits

Gage No.	Gage Limits A	B	C	D	E	F	G	H	I	J	K	L
10	1.1250	1.2500	1.3750	1.5000	1.6250	1.7500	1.8750	2.0000	2.1250	2.2500	2.3750	2.5000
9	1.1125	1.2375	1.3625	1.4875	1.6125	1.7375	1.8625	1.9875	2.1125	2.2375	2.3625	2.4875
8	1.1000	1.2250	1.3500	1.4750	1.6000	1.7250	1.8500	1.9750	2.1000	2.2250	2.3500	2.4750
7	1.0875	1.2125	1.3375	1.4625	1.5875	1.7125	1.8375	1.9625	2.0875	2.2125	2.3375	2.4625
6	1.0750	1.2000	1.3250	1.4500	1.5750	1.7000	1.8250	1.9500	2.0750	2.2000	2.3250	2.4500
5	1.0625	1.1875	1.3125	1.4375	1.5625	1.6875	1.8125	1.9375	2.0625	2.1875	2.3125	2.4375
4	1.0500	1.1750	1.3000	1.4250	1.5500	1.6750	1.8000	1.9250	2.0500	2.1750	2.3000	2.4250
3	1.0375	1.1625	1.2875	1.4125	1.5375	1.6625	1.7875	1.9125	2.0375	2.1625	2.2875	2.4125
2	1.0250	1.1500	1.2750	1.4000	1.5250	1.6500	1.7750	1.9000	2.0250	2.1500	2.2750	2.4000
1	1.0125	1.1375	1.2625	1.3875	1.5125	1.6375	1.7625	1.8875	2.0125	2.1375	2.2625	2.3875
0	1.0000	1.1250	1.2500	1.3750	1.5000	1.6250	1.7500	1.8750	2.0000	2.1250	2.2500	2.3750

take all measurements at the large end adjacent to the head. As previously explained, all bolts are turned to the desired size by reading the graduated dial on the taper turner.

Tool-Room Lathe Redesigned

Realizing that economy in the production of tools and fixtures in the tool room is just as essential as the resulting product that must be built by the use of these tools and fixtures, economy in operation was primarily one of the important factors considered in the design of the illustrated tool-room lathe manufactured by the R. K. LeBlond Machine Tool Company, Cincinnati, Ohio. The lathe is being manufactured in 12-in., 14-in., 16-in. and 18-in. sizes.



The redesigned LeBlond tool-room lathe

The headstock of the lathe has a heavy heat-treated nickel-steel spindle rolling in antifriction bearings of large diameter. The spindle is supported at short intervals with a center bearing to minimize any tendency toward deflection at the spindle nose. All of the heat-treated gears are cut and ground to produce a quiet smooth-running gear train. The reverse gears and compounding gears have been removed from the end of the lathe and built inside of the head, eliminating troublesome hanging brackets and change gears, and simplifying changing of these gears by two handles on the front of the headstock. Automatic lubrication of filtered oil is furnished to all bearings; a sight-feed indicator is used to check the oil flow.

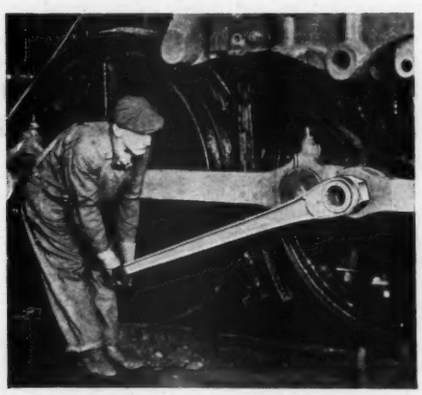
The one-piece double-wall box-type apron has been simplified so that the operation of the carriage and cross slides is performed with a minimum of effort and movement on the part of the operator. One lever controls the movement both of the carriage and cross slide. For thread chasing a central position of the feed-control handle releases the dog that locks the half nuts out of engagement. One-shot lubrication is provided through a plunger pump that forces oil to the apron bearings, the cross-slide and the bed ways. With the improved leadscrew reverse the direction of the carriage can be changed with the use of either the leadscrew or the feed rod without changing the direction of rotation of the spindle. A lever on the right side of the apron shifts the single tooth clutch in the thread and the feed gear train that controls the direction of the rotation of the leadscrew and the feed rod. With the leadscrew reverse, more accurate threads can be cut, since the single tooth clutch insures an accurate register between the leadscrew and the lead being cut. Adjustable automatic stops are provided to disengage the feed mechanism in both directions. When the stop disengages the leadscrew at the end of the thread it is only necessary to back the tool out of the thread and return it to the starting point where another stop disengages it. The tool is then set to the proper depth and the control handle is again engaged.

The feed and thread control mechanism, with all shafts on antifriction bearings, also has been simplified with a minimum of control levers to make all feed and thread changes through the entire range of 56 changes on the 12-in. and 14-in. lathes and 63 changes on the 16-in. and 18-in. lathes. The precision leadscrew is held between the ball thrust bearings on each end of the screw so that it is in tension when cutting right-hand or left-hand threads.

The conventional type of right-angle drive tailstock has been redesigned to increase its general usefulness. The extra long spindle now has a full-length bearing in the tailstock body even when the center is well extended, and the hole through the spindle is exceptionally large, making it possible to pass the bar stock through the tailstock and headstock spindles. Spindle movements of the tailstock is effected by a rack and worm, forming a positive lock to the spindle against backing out. The travel is greater than would ever be needed for a piece held between the centers and adequate for most drilling and boring operations without reclamping the tailstock screw. The position of the hand wheel at an angle on the front of the tailstock makes it easy to operate. Attachments are available for all types of general tool-room work.

Reversible Ratchet Wrench

Heavy-duty reversible ratchet wrenches with quadruple pawls instead of the usual two, with drop-forged handles, and with both hex and square sockets with the hole extending clear through for turning nuts on any length of bolt are recent additions to the line of wrenches manufactured by J. H. Williams & Company, New York, N. Y. These wrenches, called "Superector," have been fitted with the quadruple pawls to provide double bearing and increase the strength of the tool. The handles are drop-forged to utilize the extra strength afforded by the pawls. The wrenches have openings from 1 1/16 in. to 4 5/8 in. and are made in five sizes from 24 in. to 53 in.

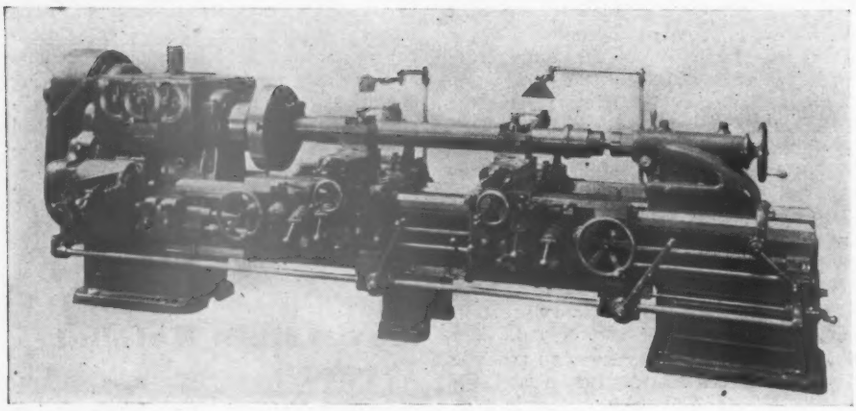


"Superector" socket wrench

High-Speed Piston-Rod Lathe

The American Tool Works Company, Cincinnati, Ohio, has developed the high-speed piston rod roughing and finishing lathe shown in the illustration. This is a 24-in. heavy pattern lathe which swings 27 1/2 in. over the bed and is driven by a 25-hp. motor, either constant or adjustable speed. Two offset carriages are provided to permit two cuts on the work to be taken simultaneously. Each carriage has control of the spindle through a mechanical apron control unit, and is equipped with front and rear tool rests for holding multiple tools. One carriage is provided with a taper attachment for machining the crosshead fit.

In order that this lathe may be used



The American 24-in. piston-rod lathe

effectively with either high-speed steel or cemented carbide cutting tools it is equipped with a high-speed antifriction geared head which provides spindle speeds suitable for either type of cutting tools. The head mechanism is oiled automatically by means of a pump circulating system and the entire transmission is made of alloy steel, hardened, ground and lapped. The shafts are heat-treated and the multiple splines are ground in the latest spline grinding machines. To provide for the high cutting speeds permitted by cemented carbide cutting tools, the work supporting tailstock is made extremely massive and rigid with a large-diameter spindle and an antifriction center built into the spindle on Timken bearings.

The 25-hp. motor is mounted on a substantial pedestal attached to the rear of the head end cabinet leg, and is connected to the head driving unit by multiple V-belts.

Portable Unit for Cutting and Threading Pipe, Bar stock and Bolts

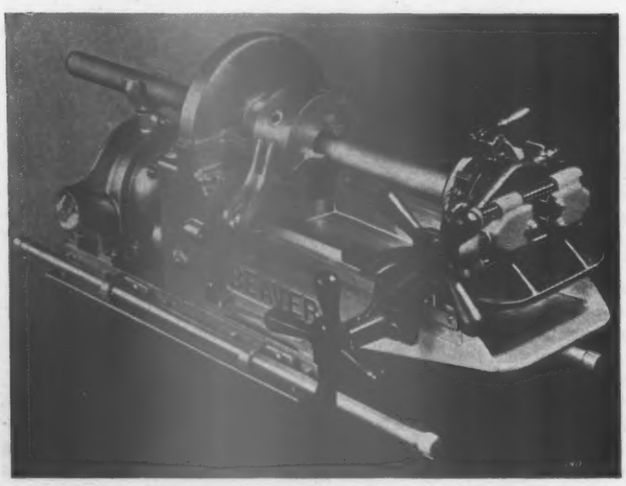
The illustrated portable machine for cutting and threading pipe, barstock and bolts is now being offered by Beaver Pipe Tools, Inc., Warren, Ohio, with the choice of either wheel-and-roller or automatic-knife cutoff, in addition to the standard features of rack-and-pinion feed, quick-opening fully adjustable die heads, full ⅛-in. to 2-in. threading range, and right-hand operation. The unit, designated as the Beaver Model A cutting and threading machine, is equipped with a heavy-duty Universal motor to operate on any 110-volt, 25 to 60 cycle circuit; it can also be furnished with a 220-volt motor. The motor, reversible through switch control, is mounted in the base of the machine and is connected by means of a flexible coupling to a heavy-duty helical all-gear drive.

Other features of the machine include: An automatic chuck-wrench ejector as a safety feature should the operator forget to remove the chuck wrench; an outboard pipe support which is adjustable for centering the pipe and for preventing the whip of long pipe lengths; adjustable quick-opening die heads of the solid ring type the four units of which move as a unit to insure uniform adjustment and even distribution of cutting on all four segments; a thread length indicator; a multi-fluted cone reamer for removing pipe burrs.

The wheel-and-roller cutoff cuts ⅛-in. to 2-in. pipe and ⅜-in. to 1-in. solid round bars. This cutoff is fed manually by a star wheel at the operator's right hand. It cuts 2-in. pipe in from 10 to 12 sec.

The automatic-knife cutoff cuts ¼-in. to 2-in. pipe, but will not cut solid round bars. The cutting knives, which are operated by a star wheel, have a safety guide ahead of the cutting edge to control the depth of the cut and to prevent hogging in. Self-centering V-jaws support the pipe and prevent chattering while cutting. The knife blocks are backed up by heavy springs to cushion the shock and prevent knife breakage when cutting out-of-round pipe.

The machine is sufficiently powerful to cut and thread 2½-in. to 12-in. pipe with Beaver geared tools and drive shaft. It is furnished either with sliding handle bars or mounted on a wheeled under carriage.



The Beaver Model A cutting and threading machine now equipped with either wheel-and-roller or automatic-knife cutoff

Mercury-Mazda Lighting Units

For industrial lighting where color correction is necessary, a combination 250-watt mercury-mazda lighting unit has been announced by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa. Designed for mounting heights of 8 ft. to 18 ft., these units mix the light lumens of the mazda with the mercury lamp, giving the required color correction.

Combination mercury-mazda lighting unit

Two distinct circuits are used; one to control the mercury lamp and one to control the mazda lamps. The design is such as to allow three 60-watt, three 75-watt or three 100-watt mazda lamps to be used without interfering with the restarting of the mercury lamp in case of a voltage interruption. The unit consists of an aluminum reflector, with socket assembly and a Monax diffusing hinged glass bowl. The reflector is made from 14-gage commercially pure aluminum sheet of etching grade. The entire surface is Alzaked for greater permanence and ease of cleaning.

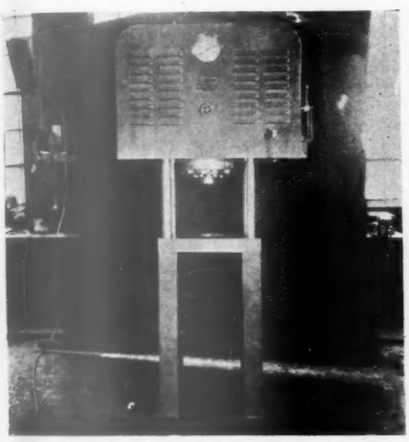
The socket assembly which consists of three medium sockets for the mazda lamps and one socket for the mercury lamp is attached to the top of the reflector. A slip-type louvered cover provides sufficient ventilation for the sockets and allows for wiring or inspection of wiring after the reflector is in position. It is arranged for mounting on ½-in. conduit. The diffusing bowl is banded at the fitter and hinged in the reflector. A felt gasket forms a joint between the glass and the reflector. The

entire assembly is simple to wire and the hinged glass bowl makes the lamps easily accessible and eliminates the hazard of removing large globes. Sufficient ventilation is provided to keep the temperature within safe operating limits.

Reverse-Cylinder Bushing Press

The illustration shows a self-contained cylinder bushing press with the hydraulic power unit mounted on the top platten. This power unit consists of a high-pressure variable-pressure piston pump of the rotary type, an electric motor, and the operating valves. The movement of the ram is controlled by means of a single lever which actuates a four-way operating valve.

The press has a capacity of 20 tons with an operating pressure of 2,000 lb. per sq. in. on a 5-in. diameter ram which has a stroke of 10 in. The plattens are 16 in. square, with a vertical opening between the plattens of 12 in. The press, mounted on legs to give a distance of 3 ft. 4 in. from the floor to the face of the bottom platten, is the product of the Watson-Stillman Company, Roselle, N. J.

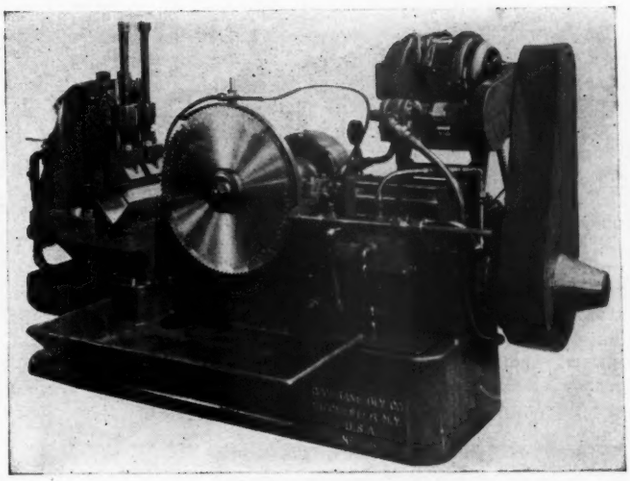


The Watson-Stillman 20-ton bushing press

Hydraulic Saw For Non-Ferrous Material

The illustration shows a high-speed hydraulic cold saw for the cutting of non-ferrous tubing and bars. It has a four-speed sliding gear transmission through hardened alloy-steel gears, hardened steel worm and phosphorus-bronze worm gear, running in oil. All drive shafts including the saw spindle are mounted in antifriction bearings.

Remote control is provided for changing the saw cutting speeds from 235 to 600 ft. per min. and the hydraulic feed is adjustable from 0 to 60 in. per min. The machine has an automatic trip, rapid return of carriage and rapid forward traverse of carriage. Adjustable stops regulate the travel of the carriage to the size of tube being cut. The machine has a hydraulically operated vise with compound toggle link and vertical slide carrying adjustable clamp screws each side of the saw blade. These screws are fitted with removable V or radius blocks to prevent distortion of thin-walled tubing under clamping pressure.



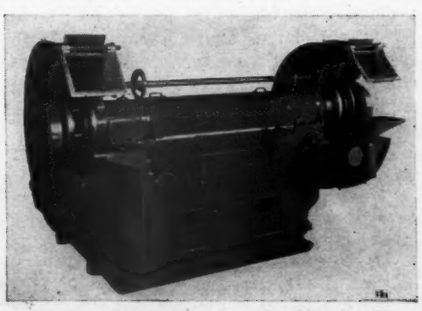
The Cochrane-Bly hydraulic cold saw

An extended pan provides large storage space for chips and permits the easy access of a shovel for their removal. A tank for hydraulic oil is located under the base of the machine, and the base provides a sump for the drainage of cutting oil.

The machine is motor driven through multiple V-belts, and has a friction clutch for instant stopping and starting. It weighs 5,000 lb. and has a capacity for cutting tubes up to 8 in. diameter in 80 sec. The machine is the product of the Cochrane-Bly Company, Rochester, N. Y.

High-Speed Snagging Grinder

The Standard Electrical Tool Company, Cincinnati, Ohio, announces that its No. 50 high-speed snagging grinder is now available as a single-speed machine to take 30-in. diameter by 4-in. face by 12-in. hole grinding wheels to operate at 9000 surface ft. per min. The machine is powered by 15-hp. 900 r.p.m. ball-bearing motor located inside the base. Power is transmitted to the grinding spindle by V-belt drive. The guards are made of fabricated boiler-plate steel and are adjustable to the wear of the grinding wheels. The spindle has an overall length of 74 in. and is 4 in. in diameter. The net weight of the No. 50 grinder is 4,100 lb.



The Standard No. 50 high-speed snagging grinder

This same machine is available to carry 20, 24 or 30 in. diameter wheels with provision for increasing the grinding spindle speed to maintain 9000 surface ft. per min. on the grinding wheels.

Stationary and Traveling Hoists

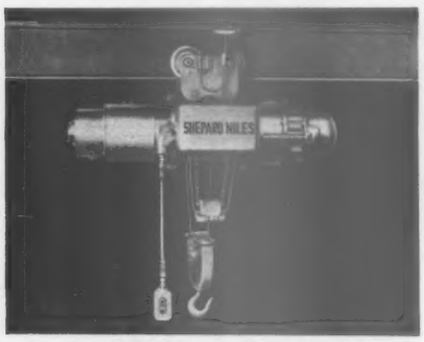
The Shepard Niles Crane & Hoist Corporation, Montour Falls, N. Y., recently placed on the market electric hoists designated as the "LiftAbout" which can be furnished as a stationary unit, as a traveling unit with a push, geared, or motorized trolley, as a unit with a top hook for hanging it in various locations, or as a unit which can be applied to carriers of different types of tramrail systems. All of these units with the exception of the stationary type can be furnished in different sizes with capacities ranging from the 250 lb. to 6,000 lb. and with lifts varying from 18 ft. to 30 ft., depending upon the type of drum used. The stationary type can be furnished with capacities varying from 125 lb. to 3,000 lb. and with a winding capacity of 36 ft.

The LiftAbout hoist is applicable wherever it is necessary to raise the load hook as close as possible to the underside of the I-beam from which the hoist is suspended. The hoist frame is cylindrical in form supporting rigidly the moving parts of the hoist, insuring permanency of alinement and quiet operation. It also forms a dust and moisture-proof enclosure for all the operating mechanism. The hoist gearing consists of a double train of heat-treated spur gearing, machine cut from forged alloy- or high-carbon-steel blanks. The driving pinion, which is an integral part of the motor-shaft extension, drives the gear train at two points diametrically opposite, thus balancing all stresses. Roller bearings are used throughout.

A multiple-disc mechanical load brake holds the load when the motor is at rest, and prevents excessive speed in lowering. It interposes no resistance in hoisting, and in lowering it offers only sufficient resistance to control the load. It will set when-

ever the load tends to descend at a speed slightly greater than that corresponding to the speed of the motor. Adjustments are made from the outside. A multiple-disc electric brake serves to bring the motor promptly to rest whenever the current is interrupted or cut off intentionally. It is connected in the motor circuit and is always set unless held off by current flowing through its windings. Adjustments are made from the outside.

The splined winding drum is machine grooved and has its flanges guarded. The hoisting rope is dead-ended to the hoist frame by means of a safety anchorage. The load block is of the safety type. Rope sheaves operating on roller bearings are guarded by a steel enclosure of a form avoiding any wedging action between the



Shepard-Niles "LiftAbout" Crane

enclosure and the rope. The load hook is of heat-treated steel and is arranged to swivel on ball bearings.

The electric motors for either a.c. and d.c. power are manufactured by the Shepard Niles Crane & Hoist Corporation for use exclusively with the hoists. Direct-current motors are series wound and are provided with commutating poles. Alternating-current motors are of the high-torque polyphase induction type, with either wound rotor or squirrel-cage winding, according to the type of control specified.

All motors are fully enclosed and rated at 30 min. full load with a 55-deg. C. rise.

The motor controllers are designed and manufactured for hoist service, in single-speed and multiple-speed types, operated either by push button or pendant ropes. Single-speed push-button magnetic controllers are furnished with two Shepard Niles contactors with mechanical interlock.

Multiple-speed push-button magnetic controllers provide five independent hoisting or lowering speeds by one push button. All speeds are under full control of the operator. An emergency stop switch, arranged to open all circuits is provided. The controllers operated by pendant-ropes are self centering. The hoists are provided with limit switches of the weight type, operating through a contactor. It is arranged to open the hoist-motor circuit at the upper limit of travel of the load block. When the load block has a tendency to over drift, a momentary lowering circuit is established.

The motor, controller, gearing and mechanical brake, electric brake, limit switch and winding mechanism are each independent of one another. Any of the units enumerated is separately accessible and may be completely disassembled without disturbing any other unit.

Respirator for Spray Painters

The Binks Manufacturing Company, Chicago, announces the addition of a lightweight respirator to its line of spray equipment and accessories. Known as

Binks lightweight respirator

Binks No. 10 pad-type respirator, it consists of a flexible aluminum frame which holds a specially treated replaceable pad over the operator's nose and mouth, conforming to the contour of the face. The respirator permits full vision and unhampered working freedom.

One-Piece Welding Helmet

A welding helmet, formed of one-piece black vulcanized fiber and cut deeply to offer side protection to a point well back of the ears, has been added to the line of protective devices for head, eyes, nose, throat and lungs manufactured by Willson Products, Inc., Reading, Pa. The usual riveted, lapped-over seams or joints are eliminated in the design of this helmet. A

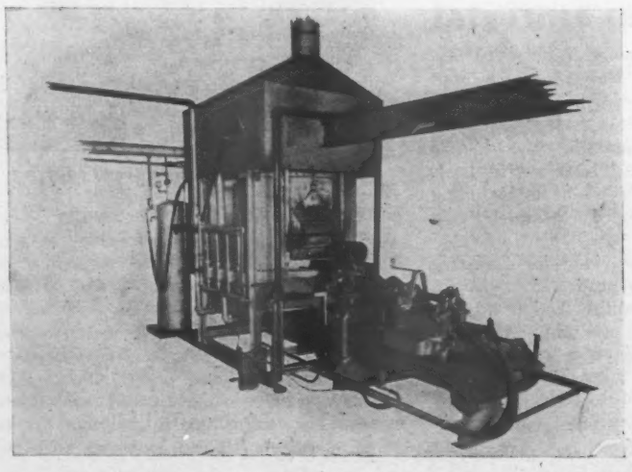
Willson welding helmet fabricated in one piece

smooth, rounded interior promotes air circulation and results in a well ventilated, cool, comfortable helmet. The Willson Company is making several different styles of helmets and hand shields in one-piece construction.

Centrifugal Casting Of Xaloy

A method of centrifugal casting perfected by the Wilcox-Rich Division of the Eaton Manufacturing Company, Detroit, Mich., under license from the Industrial Research Laboratories, Ltd., involves the application of Xaloy in a molten state to the outside or inside diameters of bushings or other tubular pieces subjected to abrasive wear. The coating of Xaloy has uniform surface hardness and uniform thickness. Due to the extreme hardness and abrasion resistance of this metal, the thickness of the wall is controlled very closely to reduce to a minimum the finishing operation for which special honing and grinding equipment is required. The resulting surface is mirror-like with a low coefficient of friction.

Application of the metal to irregular surfaces is accomplished by means of casting in permanent or sand moulds or by the use of inserts faced with Xaloy. Narrow flat surfaces or edges are coated with Xaloy by the centrifugal-casting method; however, sizes are at present somewhat restricted. Applications which seem apparent from the need for such a surface include drill and reamer bushings, deep drawing



Furnace for the centrifugal casting of Xaloy

dies, sizing dies, briquetting moulds, workrest blades, ring and plug gauges, packing gland sleeves, cylinders, pilot bars and valves. In ascertaining the usefulness of Xaloy in the general industrial field it was found, for instance, that the life of tool bushings is lengthened 500 to 600 per cent.

Xaloy is most suitable where its high hardness and unusual resistance to abrasion can be used to advantage and where high impact values and ductility are not important. It has a tensile strength of 43,000 lb. per sq. in. and compression strength of 240,000 lb. per sq. in. Its coefficient of thermal expansion is 0.0000072 in. per in. per deg. F. and its thermal conductivity is 7.5 B.t.u.'s per hr. per sq. ft. per deg. F. Its hardness is equivalent to 750 Brinell or 68 to 70 Rockwell C scale.

Recording Pyrometer

A recording potentiometer pyrometer of the round-chart type, known as the "Pyromaster," has been developed by The Bristol Company, Waterbury, Conn. The instrument is also available as an electric-type controller, with metal-to-metal contacts. It operates on an entirely different principle, which makes possible the following features:

It requires no lubrication; it is not affected by normal plant vibration; there is no mechanical motion of any kind except when a change in the measured quantity takes place; and it can be used under exceedingly rough plant conditions where the air is laden with moisture, corrosive fumes or dust. The operating mechanism consists of five small compact units which are replaceable. There are no mechanical connections of any kind between the galvanometer unit and the other units. The pen is actuated in such a way as to follow changes in the measured quantity as they occur and at a rate dependent upon the rate of change. The entire mechanism is built in a standard Bristol's instrument case of moisture-, fume-, and dust-proof construction for wall or flush panel mounting.

Bristol recording potentiometer pyrometer

Carbon And Alloy Steel Wrenches

J. H. Williams & Company, 75 Spring Street, New York City, announce two lines of adjustable wrenches with square shoulders on the movable jaw shank to overcome the wedging and spreading action common to the conventional cylindrical bearing and to provide a positive bearing against working stress. This design permits a thicker and stronger web without increasing the total head thickness of the wrench. The two lines of wrenches are called "Adjustable" and "Superjustable," respectively.

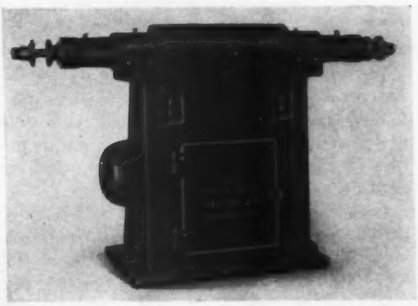
Williams "Adjustable" wrench with square shoulders on movable jaw shank

The "Adjustable" wrenches are drop-forged from carbon steel. This line is supplied in a natural polished steel finish. The "Superjustable" wrenches are forged from chrome-alloy steel, designed for lightness and strength. This line is finished in chrome-plate with highly polished heads and satin-finish handles. Both lines are available in sizes of 4, 6, 8, 10 and 12 in.

Texdrive Buffing and Polishing Machines

Texdrive buffing and polishing machines with externally mounted motors of any size or type desired and ranging in size from 3 hp. to 25 hp. have recently been placed on the market by the Hisey-Wolf Machine Company, Cincinnati, Ohio. The motor is mounted externally behind the unit and V-belt connected to the spindle, thereby eliminating the motor housing from the top of the pedestal and providing any and all speeds for any size or kind of buffing and polishing wheel, regardless of the electric current available.

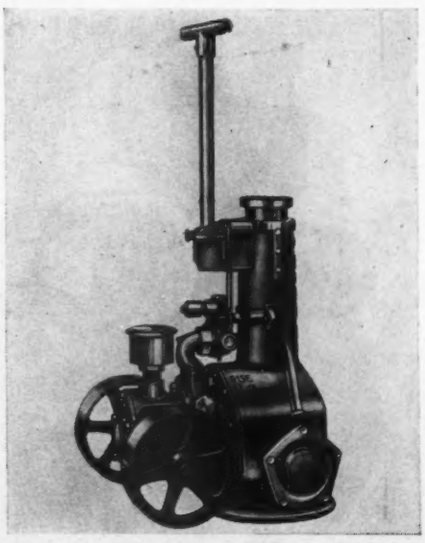
The spindles of the machine are of one-piece construction and are made of heat-treated spindle steel. All the bearings are oversize ball bearings mounted close to the wheels. Each inner race is locked individually on the shaft without the use of sleeves or bushings, and have labyrinth seals to exclude dust and grit. Each bearing is individually lubricated, being equipped with a filler, an oil lever and a drain. The bearing housings have a full-length keyway on top of the column to assure permanent alignment. The spindles and bearing housings are removable as an integral unit without disturbing the bearings. The machines are made with either one or two spindles and with single- or double-motor drive, respectively.



The Hisey-Wolf two-motor two-spindle buffing and polishing machine with motor mounted externally

Rotary-Motor Power Jack

The Duff-Norton Manufacturing Company, Pittsburgh, Pa., has developed a power jack equipped with a rotary-type motor for use in car and locomotive repairing which operates with greatly increased speed on the average air pressure maintained in railway shops. Tests by the manufacturer indicate that the load can be raised 25 to 50 per cent faster than with former types of jacks. The same shop tests also indicate that the jacks consume no more air per unit of work done than ordinarily required despite its increased lifting speed. The rotary motor now makes it possible to regulate these jacks by means of an adjusting screw when operating them



Duff-Norton power jack equipped with rotary-type air motor

in pairs, thus assuring one-man control of the heaviest loads.

These jacks are built in capacities of 50, 75 and 100 tons with raises of 14, 17, 25 and 30 in., and are equipped with large wide-treaded wheels and a folding handle built integrally with the jack, making for easy portability over rough shop surfaces or soft ground.

Construction features include ball-bearing thrust and radial mountings throughout, an automatic shut-off which cuts the motor off when the lifting standard reaches the safe limit or its lift or depth, and an up-and-down throttle control assuring finger-tip control under all loads.

In addition to this power jack equipped with a rotary motor, Duff-Norton will also continue to manufacture jacks operated by piston-type air motors.

Electric Hoists For Low-Head Room

Two small low-head-room electric hoists built in sizes to lift 350 and 700 lb. have just been placed on the market by Shaw-Box Crane & Hoist Company, Inc., Muskegon, Mich., under the trade name "Load Lifter Junior." They are replicas of the larger capacity low-head-room electric hoists manufactured by this firm. With them the distance from the bottom of the track on which the hoists operate to the hook when in its highest position is less than that of a chain hoist suspended from a trolley, it being only 12¾ in.

These small hoists have a lifting speed of 20 ft. per min. with rated capacity loads, and give a hook lift of 18 ft. Control is by push buttons contained in a unit sus-

The Shaw-Box small electric hoist for low-head-room locations

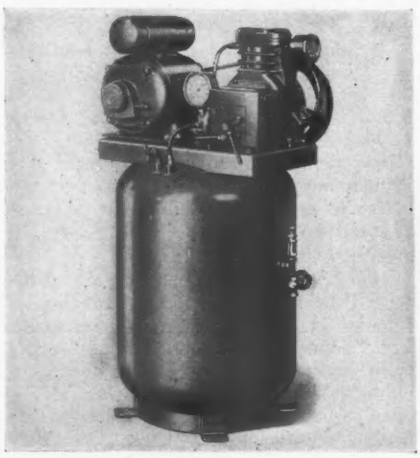
pended from the hoists. The hoists are comparatively light in weight, weighing only 185 lb. ready to operate, complete with trolley.

The gear train of the hoists consists of only two gears and pinions. Ball bearings are employed at every bearing. The motor is of the totally enclosed ball-bearing type. The hoists are equipped with two brakes, an electrically operated motor brake and an automatic mechanical load brake of the roller ratchet type that controls the load during lowering so that the lowering speed is approximately the same as the hoisting speed. The hoist is totally enclosed, all parts being built into the hoist frame. The gearing and mechanical load brake operate in an oil bath.

Fractional-Horsepower Air Compressors

The Ingersoll-Rand Company, Phillipsburg, N. J., has developed a line of fractional-horsepower air compressors made in ¼-hp. and ½-hp. sizes. They have automatic start-and-stop control and are equipped with a seamless steel tank and an improved check valve.

When furnished for single-phase current they are equipped with a brushless capacitor-type motor and a built-in automatic protection switch, giving overload



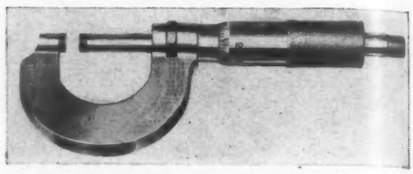
Ingersoll-Rand ¼-hp. single-stage air compressor

and under-voltage protection. They are rated for 150 lb. per sq. in. maximum pressure, but may be set for lower pressures, or may be equipped with a reducing valve for still lower pressures.

The ¼-hp. and ½-hp. units, available on a 2.4 cu. ft. tank as illustrated, are less than 35 in. high. The ½-hp. size is also available on a 4.6-cu. ft. tank in either vertical or horizontal mounting. If desired, the units can be furnished without the tank.

Carboloy Tips For Micrometers

The Carboloy Company, Inc., Detroit, Mich., manufacturers of cemented carbides, announces a micrometer tipping service available to all micrometer users. By means of this service the micrometer user sends his micrometer to the Carboloy Company, who tips with Carboloy cemented carbides the wear points at the



Micrometer with anvil and spindle tipped with Carboloy

ends of the anvil and spindle. The micrometer is then accurately adjusted and returned to the owner, ready for immediate use. It is reported that the micrometers will hold to a closer degree of accuracy during a period of use that averages at least 50 times longer life than micrometers without Carboloy tips.

Light-Weight High-Cycle Reamers

The Black & Decker Manufacturing Company, Towson, Md., has recently designed two high-cycle reaming motors of the flat type for ready accessibility in narrow clearances. The units designated as the Black & Decker-Van Dorn No. 225 and No. 350 high-cycle reamers are more powerful per pound weight than former models, being made of heat-treated aluminum castings. A safety switch control is de-

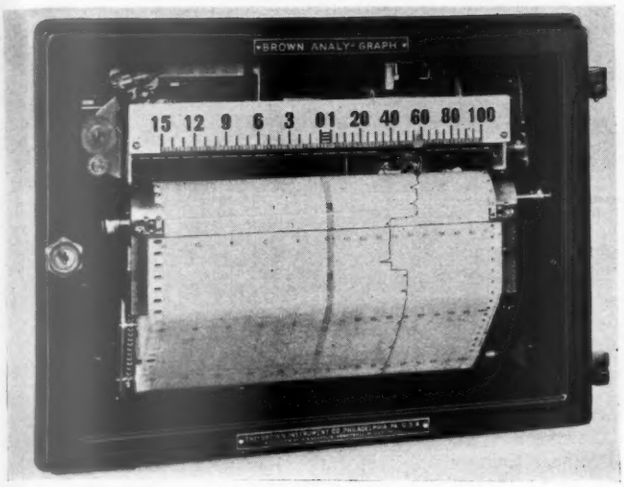
Light-weight Black & Decker-Van Dorn reaming motor, adapted to reaming rivet and stay-bolt holes

signed to cut off instantly when the operator's grasp on the handle is released. The reamers are designed for heavy-duty drilling and reaming in fabricating plants, railway repair shops, structural-steel and bridge shops. They are specially adapted to reaming rivet and stay-bolt holes.

Measuring Quality of Furnace Atmosphere

The Brown Instrument Company has brought out a furnace atmosphere "Analy-Graph" which has been produced after elaborate testing to determine the most important measurable factors in furnace atmospheres. The tests covered both electric and fuel-fired furnaces, two widely differing sources of gas feed, and a wide range of temperatures with varying adjustments of air-gas ratios.

The recording instrument is of the potentiometer type and is equipped with a chart 12-in. wide graduated so as to render the equipment applicable to measure atmosphere quality whether the atmosphere results from complete or incomplete



Left: The Brown "Analy-Graph" for analyzing gas atmospheres in heat-treating furnaces

combustion, or from dissociation. The equipment operates on the principle of measuring the thermal conductivity of the gas mixture which is continuously drawn from the furnace. If the gas is the result of complete combustion, the thermal conductivity will be less than 1.00 due to the presence of CO_2, while if the sample has been produced by incomplete combustion or by dissociation, the thermal conductivity will nearly always be greater than 1.00—the only exception being when there is less than one per cent combustible in the final mixture.

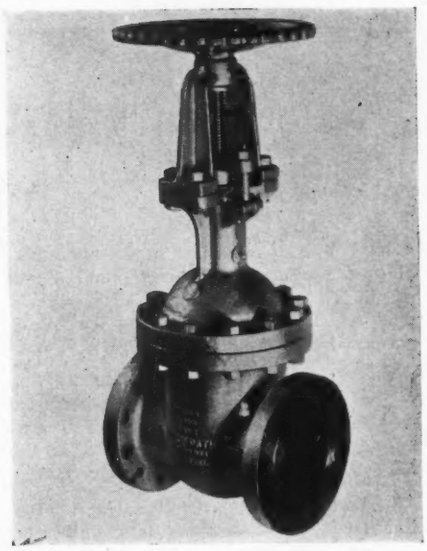
In order to render the instrument equally useful for measuring all types of atmospheres, the chart has been divided into two equal sections; one section is used when combustion is complete, while the other is used when combustion is incomplete. This is accomplished by using different electric sensitivities for the Wheatstone bridge through a patented feature.

The Analy-Graph was designed for use in heat-treating where it is now generally recognized that for best results in preheating, hardening, and carburizing special gas atmospheres must be maintained around the metal. It does away with guess work in establishing the furnace atmosphere and applies potentiometer accuracy to the measurement of furnace-atmosphere quality. It is independent of normal variations in furnace pressure, room temperature, and atmosphere humidity. The large scale on the instrument permits operators to observe continually the condition of their furnace atmosphere even at a distance.

One-Piece Ratchet Threading Dies

Beaver Pipe Tools, Inc., Warren, Ohio, recently placed on the market the illustrated No. 6-R Beaverette ratchet die for threading ¼-in., ⅜-in., ½-in. and ¾-in. pipe without changing the dies or bushings. Two sets of dies are always in the tool, since this threading range covers two different thread pitches. The dies can be adjusted for cutting oversize or undersize threads on the pipe which is centered in the tool by a Universal pipe guide. The tool is so designed that close nipples can be threaded.

The Beaverette No. 6-R one-piece ratchet die



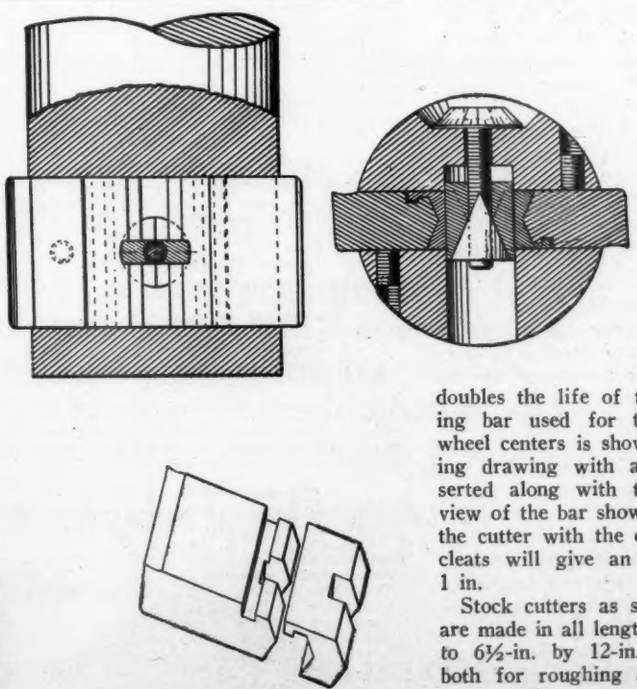
Heavy walls, deep stuffing boxes, and oversize stems are features of Walworth heavy-duty steel gate valves

Heavy-Duty Steel Gate Valves

Heavy wall thicknesses, deep stuffing boxes, oversize stems, streamline flow and steel handwheels with fluted non-slip rims are some of the latest engineering features included in Walworth steel gate valves now available for 150 lb. and 300 lb. steam pressures. Made of carbon Molybdenum steel (identification symbol C-1) to A.S.T.M. specifications A-157-36, they meet the requirements of all applicable specifications. The illustration shows one of the 300-lb. valves. They are the products of the Walworth Company, New York, N. Y.

Adjustable Boring-Bar Cutters

The Apex Tool & Cutter Company, Inc., Shelton, Conn., have added another adjustable tool to its line of inserted tools by the adaption of a separate cleat which, when used with its boring-bar cutters, doubles the life of the cutter. The boring bar used for turning and finishing wheel centers is shown in the accompanying drawing with a pair of cutters inserted along with the cleats. The side view of the bar shows the added length of the cutter with the cleat in place. These cleats will give an overall extension of 1 in.



Apex adjustable boring-bar cutters

Stock cutters as shown in the drawing are made in all lengths for 4½-in. by 8-in. to 6½-in. by 12-in. wheels and ground both for roughing and finishing iron or steel. All cutters are forged of selected high-speed steel and uniformly heat-treated.

Among the Clubs and Associations

NEW YORK RAILROAD CLUB.—The annual golf tournament, field day and dinner of the New York Railroad Club will be held on Tuesday, June 8, at the Westchester Country Club, Rye, New York.

EASTERN CAR FOREMANS' ASSOCIATION.—The Eastern Car Foremans' Association will hold its annual field day and golf tournament on Thursday, July 15, at the Race Brook Country Club, New Haven.

CENTRAL RAILWAY CLUB.—The Central Railway Club of Buffalo, N. Y., in conjunction with the Transportation Club of Buffalo, will enjoy its annual cruise, on Saturday, June 12.

WESTERN RAILWAY CLUB.—F. G. Gurley, assistant vice-president, Chicago, Burlington & Quincy, was elected president of the Western Railway Club at its annual dinner in Chicago on May 17. At the same meeting, M. B. McPartland, general superintendent of motive power, Chicago, Rock Island & Pacific, was elected first vice-president; E. A. Clifford, general purchasing agent, Chicago & North Western, was elected second vice-president; and C. L. Emerson, division master mechanic, Chicago, Milwaukee, St. Paul & Pacific, was re-elected executive secretary. J. W. Fogg, vice-president, MacLean-Fogg Lock Nut Company, was re-elected treasurer, and vacancies on the board of direction were filled by D. C. Curtis, retiring president; W. L. Fox, general superintendent, Chicago & Western Indiana; H. H. Urbach, mechanical assistant to executive vice-president, Chicago, Burlington & Quincy, and V. R. Hawthorne, secretary, Division IV, Mechanical, Association of American Railroads. At the same meeting, L. Robinson, assistant to general superintendent of motive power, Illinois Central, was re-appointed general chairman of arrangements. The meeting was addressed by Everett M. Dirksen, congressman from Illinois.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—The nominations for officers of the American Society of Mechanical Engineers for 1938 were announced by the Nominating Committee at Detroit, Mich., during the semi-annual meeting of the Society, May 17 to 21. Presented by the regular Nominating Committee are the following: For president, H. N. Davis, president, Stevens Institute of Technology, Hoboken, N. J. For vice-president, to serve one year: F. O. Hoagland, master mechanic, Pratt & Whitney Division, Niles Bement-Pond Co., Hartford, Conn. For vice-president, to serve two years: B. M. Brigman, Dean, Speed Scientific School, University of Louisville, Louisville, Kentucky; Hart Cooke, mechanical engineer, American Locomotive Company, Diesel engine Division, Auburn, N. Y.; W. H. McBryde, consulting engineer, San Francisco, Calif., and L. W. Wallace, director, Equipment Research, Association of American Railroads, Chicago. For managers, to serve three years: Carl Bausch, vice-president, Bausch & Lomb Optical Co., Rochester, N. Y.; S. B. Earle, Dean, School of Engineering, Clemson A. & M. College, Clemson College, S. C., and F. H. Prouty, Prouty Brothers Engineering Co., Denver, Colo.

MECHANICAL DIVISION, A.A.R.—The sessions of the convention of the Mechanical Division, Association of American Railroads, June 16-23, inclusive, will be held in the Atlantic City Auditorium, beginning promptly at 9:30 a. m., Daylight Saving Time. Afternoons and Saturdays will be set aside for inspection of exhibits. The Committee on Subjects will be appointed by the Chairman at the opening session on Wednesday, June 16, to receive from members questions for discussion. This committee will determine whether such questions are suitable ones for discussion and, if so, will report them to the Division at an appropriate time for discussion by the members. The technical program is as follows:

WEDNESDAY MORNING, JUNE 16

Address by J. M. Symes, vice-president, Operations and Maintenance Department, Association of American Railroads.
Address by Chairman—J. W. Burnett, general superintendent motive power and machinery, Union Pacific.
Action on Minutes of 1936 Annual Meeting.
Appointment of Committees on Subjects, Resolutions, Correspondence, etc.
Unfinished business.
New business.
Report of General Committee.
Report of Nominating Committee.
Discussion of Report on Lubrication of Locomotives.

THURSDAY MORNING, JUNE 17

"Research and Locomotive Development," by W. H. Winterrowd, vice-president, Franklin Railway Supply Company, Inc.
Discussion of Report on Locomotive Construction.

FRIDAY MORNING, JUNE 18

Discussion of Reports on:
Electric Rolling Stock.
Specifications for Materials.
Joint Committee on Utilization of Locomotives and Conservation of Fuel.
Safety Appliances.
Air Conditioning and Equipment Lighting.

MONDAY MORNING, JUNE 21

Address: Hon. Frank McManamy, member, Interstate Commerce Commission.
Discussion of Report on Car Construction.

TUESDAY MORNING, JUNE 22

"What Next in Car Equipment?" by L. K. Sillcox, first vice-president, New York Air Brake Company.
Discussion of Reports on:
Arbitration Committee.
Committee on Prices for Labor and Materials.
Committee on Loading Rules.
Committee on Tank Cars.
Committee on Lubrication of Cars.

WEDNESDAY MORNING, JUNE 23

Discussion of Reports on:
Couplers and Draft Gears.
Brakes and Brake Equipment
Wheels.
Election of Members of General Committee.

Club Papers

Tank Car Design

Chicago Car Foremen's Association.—The regular monthly meeting of the Car Foremen's Association of Chicago held May 10 at the LaSalle hotel, Chicago, was addressed by R. W. Thompson, chief engineer, General American Transportation Corporation, on the general subject "Tank Cars—Their Design and Services." ¶ Mr. Thompson devoted the first part of his paper to a discussion of tank car specifications, truck design, underframe, bolster slabbing, anchorage, center of gravity and heater pipes. He discussed the A.A.R. tank car classification also the I.C.C. specifications for shipping containers for various commodities, tank linings of various types and special cars for the transportation of such materials as ethyl fluid, caustic soda, sulphuric acid, beer, etc. ¶ In preparing this paper Mr. Thompson said "it has been my desire first to give an early history of the tank car and to show how advancement has been made in its specifications, later to show how by years of operation improvements have been made in its construction, how its parts have been perfected to enable the car to remain in continuous operation and, finally, how the development of new tank cars for special services has contributed in bringing new and additional business to the railroads."

A.S.M.E. Meets at Detroit

American Society of Mechanical Engineers.—The 1937 semi-annual meeting of the American Society of Mechanical Engineers, held May 17-21, inclusive, at Detroit, Mich., proved of sufficient general interest to attract a registered attendance of 940 members and guests, including a considerable number of representative men in the railway and railway supply fields. The five-day meeting was notable for the inclusion of addresses and papers on eight definite railroad subjects and, in addition, several other papers presented information having an important bearing on present and future railroad problems. ¶ In the first general session, following a keynote address by C. F. Hirshfeld, chief on research, the Detroit Edison Company, on the influence of automotive production methods in other engineering fields, the subject "Modern Locomotive and Axle Testing Equipment," was discussed in a paper by T. V. Buckwalter, vice-president; W. C. Sanders, general manager, Timken Railroad Division, and O. J. Horger, research engineer of the Timken Roller Bearing Company, Canton, Ohio. In presenting this paper, Mr. Buckwalter showed how improved locomotive driving and running gear reduces dynamic augment on the

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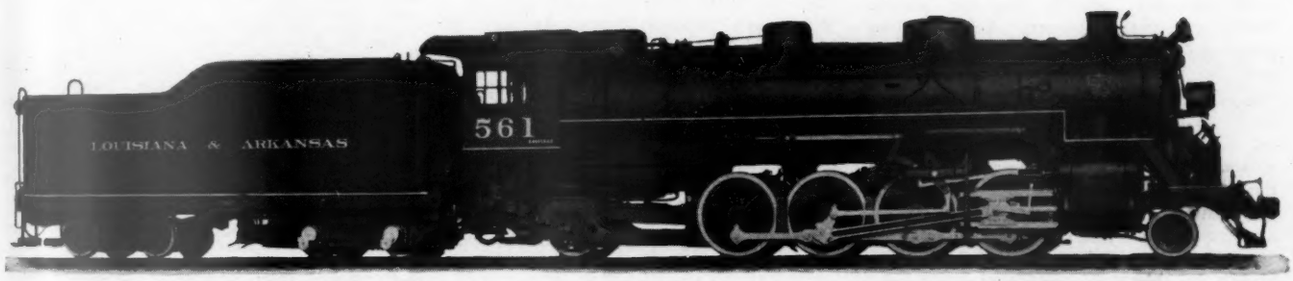
MODERN POWER

Earns More and Costs Less



Locomotive cost is not all in the locomotive itself.

Its first cost is a known factor—but what about the effects upon other costs?

Modern Power is more economical in fuel, hauls more cars faster with corresponding driving wheel loads, is easier on track and bridges, costs far less for maintenance and is available for service more hours per day.

Modern Power earns more and costs less.

LIMA LOCOMOTIVE WORKS, INCORPORATED, LIMA, OHIO

LIMA LOCOMOTIVE WORKS INCORPORATED

rail and vibration in locomotive and track structures, thus permitting much higher operating speeds with safety. Preliminary results of fatigue tests on full size driver-axle assemblies were described, as well as the influence of designs, steels, and heat treatment upon axle fatigue strength. ¶ In discussing "Automotive Engineering Applied to Railroading," Edward G. Budd, president, Edward G. Budd Manufacturing Company, Philadelphia, Pa., pointed out the differences between automobile and railroad requirements and discussed automobile and airplane design upon the design and construction of railway equipment. Topics covered included the cost per passenger mile, weight reduction, ease of assembly and interchangeability, noise elimination and more rapid acceleration and braking. At this same session the "Economics of Power for Light-Weight Trains" was presented in a paper by Rupen Eksergian, Edward G. Budd Manufacturing Company, Philadelphia. In this paper the desirability of minimum weight equipment and limited weight power plants was stressed. This paper was replete with technical formulae and quantitative discussions in graph form, which provide a basis for determining the conditions best adapted for the various forms of motive power. ¶ At a joint meeting of the American Welding Society and the Machine Shop Practice division, the subject "Welded Steel in High-Speed Railroad Service," was presented by Everett Chapman, president, Lukenweld, Inc., Coatesville, Pa. Mr. Chapman described the basic design factors in welded steel construction and the detailed stresses which must receive attention if welded structures are to give long service under dynamic loads. In this paper and particularly the discussion which followed, the point was made that in spite of the tremendous advance and improvement in welding technic in recent years, welding is by no means a panacea, and this new fabrication process must be employed intelligently and particularly with reference to the elimination of internal stresses due to expansion and contraction, or the holding of these stresses within safe limits. ¶ The subject "High-Speed Diesel-Engine Maintenance Practice on the Canadian National," was presented by I. I. Sylvester, special engineer, Canadian National, Montreal. Mr. Sylvester described the experience of the Canadian National in maintaining Diesel engine driven equipment since 1925, with particular reference to the adaptation of steam locomotive maintenance organizations and methods to this newer type of power. He stressed the importance of performance and wear measurement records without which maintenance work is bound to be more or less haphazard, inefficient and unsatisfactory. "Electricity in Transportation" was the subject of a paper and talking moving picture presented by H. L. Andrews, vice-president, General Electric Company, New York, which showed in a striking way the different types of motive power applications which railroads are using today to help solve the problem of balancing income against expenditure. ¶ In discussing "Air Resistance of Railway Equipment," A. I. Lipetz, chief consulting research engineer, American Locomotive Company, Schenectady, N. Y., described wind tunnel tests on models of locomotives, streamline cars, and power cars for Diesel electric trains, which show that air resistance is the most important factor in air resistance of railway equipment operating in still air. For all practical purposes this resistance can be represented by a simple expression involving the square of the speed and a coefficient, which depends upon the shape and construction of the vehicles. In discussing the subject "Resistance of Light-Weight Passenger Trains," A. L. Totten, transportation engineering department, General Electric Company, Erie, Pa., described how the tracks, journals, wheel flanges, air, wind, air conditioning and lighting equipment affects the resistance of modern streamline trains. Formulae were included in the paper for calculating these specific resistances and examples were given showing their application. ¶ These eight specific railroad papers mentioned were presented at four meetings held under the auspices of the Railroad Division, two of the meetings being presided over by W. H. Winterrowd, vice-president, Franklin Railway Supply Company, Chicago, and two by W. E. Dunham, superintendent car department, Chicago & North Western, Chicago. E. L. Woodward, western editor *Railway Mechanical Engineer*, served as official recorder. In addition to the papers on specific railroad subjects, the discussion "Rubber Cushioning Devices" by Dr. Hirshfeld, was of considerable general interest to railway men and the same statement may be made with regard to several papers on Lubrication, Cutting Metals, Apprenticeship and Craftsmen Training.

DIRECTORY

The following list gives names of secretaries, dates of next regular meetings, and places of meetings of mechanical associations and railroad clubs:

AIR-BRAKE ASSOCIATION.—T. L. Burton, care of Westinghouse Air Brake Company, 3400 Empire State Building, New York.

ALLIED RAILWAY SUPPLY ASSOCIATION.—F. W. Venton, Crane Company, Chicago.

AMERICAN RAILWAY TOOL FOREMEN'S ASSOCIATION.—G. G. Macina, 11402 Calumet avenue, Chicago.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—C. E. Davies, 29 West Thirty-ninth street, New York.

RAILROAD DIVISION.—Marion B. Richardson, 21 Hazel avenue, Livingston, N. J.

MACHINE SHOP PRACTICE DIVISION.—J. R. Weaver, Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.

MATERIALS HANDLING DIVISION. — F. J. Shepard, Jr., Lewis-Shepard Co., Watertown Station, Boston, Mass.

OIL AND GAS POWER DIVISION. — M. J. Reed, 2 West Forty-fifth street, New York.

FUELS DIVISION.—W. G. Christy, Department of Health Regulation, Court House, Jersey City, N. J.

ASSOCIATION OF AMERICAN RAILROADS. — J. M. Symes, vice-president operations and maintenance department, Transportation Building, Washington, D. C.

DIVISION I. — OPERATING. — SAFETY SECTION.—J. C. Caviston, 30 Vesey street, New York.

DIVISION V.—MECHANICAL.—V. R. Hawthorne, 59 East Van Buren street, Chicago. 1937 convention, June 16-23, Atlantic City, N. J.

COMMITTEE ON RESEARCH. — E. B. Hall, chairman, care of Chicago & North Western, Chicago.

DIVISION VI.—PURCHASES AND STORES.—W. J. Farrell, 30 Vesey street, New York. Annual meeting, June 21, 22 and 23, Atlantic City, N. J.

DIVISION VIII.—MOTOR TRANSPORT.—CAR SERVICE DIVISION. — George M. Campbell, Transportation Building, Washington, D. C.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS.—Jos. A. Andreucetti, C. & N. W., 1519 Daily News Building, 400 West Madison street, Chicago, Ill.

CANADIAN RAILWAY CLUB.—C. R. Crook, 2271 Wilson avenue, Montreal, Que. Regular meetings, second Monday of each month, except in June, July and August, at Windsor Hotel, Montreal, Que.

CAR DEPARTMENT OFFICERS' ASSOCIATION.—A. S. Sternberg, master car builder, Belt Railway of Chicago, 7926 South Morgan street, Chicago.

CAR FOREMEN'S ASSOCIATION OF CHICAGO.—G. K. Oliver, 2514 West Fifty-fifth street, Chicago. Regular meetings, second Monday in each month, except June, July and August, La Salle Hotel, Chicago.

CAR FOREMEN'S ASSOCIATION OF OMAHA, COUNCIL BLUFFS AND SOUTH OMAHA INTERCHANGE.—H. E. Moran, Chicago Great Western, Council Bluffs, Ia. Regular meetings, second Thursday of each month at 1:15 p. m.

CENTRAL RAILWAY CLUB OF BUFFALO.—Mrs. M. D. Reed, Room 1817, Hotel Statler, Buffalo, N. Y. Regular meetings, second Thursday each month, except June, July and August, at Hotel Statler, Buffalo.

EASTERN CAR FOREMEN'S ASSOCIATION. — E. L. Brown, care of the Baltimore & Ohio, St. George, Staten Island, N. Y. Regular meetings, fourth Friday of each month, except June, July, August and September.

INDIANAPOLIS CAR INSPECTION ASSOCIATION. — R. A. Singleton, 822 Big Four Building, Indianapolis, Ind. Regular meetings, first Monday of each month, except July, August and September, at Hotel Severin, Indianapolis, at 7 p. m.

INTERNATIONAL RAILWAY FUEL ASSOCIATION. — See Railway Fuel and Traveling Engineers' Association.

INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—William Hall, 1061 West Wabasha street, Winona, Minn. Next meeting, September 28 and 29, Hotel Sherman, Chicago, Ill.

INTERNATIONAL RAILWAY MASTER BLACKSMITHS' ASSOCIATION.—W. J. Mayer, Michigan Central, 2347 Clark avenue, Detroit, Mich.

MASTER BOILER MAKERS' ASSOCIATION. — A. F. Stiglmeier, secretary, 29 Parkwood street, Albany, N. Y. Annual meeting, September 29 and 30, Hotel Sherman, Chicago.

NEW ENGLAND RAILROAD CLUB.—W. E. Cade, Jr., 683 Atlantic avenue, Boston, Mass. Regular meetings, second Tuesday in each month, except June, July, August and September, at Hotel Touraine, Boston.

NEW YORK RAILROAD CLUB.—D. W. Pye, Room 527, 30 Church street, New York. Meetings, third Friday in each month, except June, July, August and September, at 29 West Thirty-ninth street, New York.

NORTHWEST CAR MEN'S ASSOCIATION. — E. N. Myers, chief interchange inspector, Minnesota Transfer Railway, St. Paul, Minn. Meetings, first Monday each month, except June, July and August, at Midway Club rooms, University and Prior avenue, St. Paul.

PACIFIC RAILWAY CLUB.—William S. Wollner, P. O. Box 3275, San Francisco, Cal. Regular meetings, second Thursday of each month in San Francisco and Oakland, Calif., alternately—June in Los Angeles and October in Sacramento.

RAILWAY CLUB OF GREENVILLE. — J. Howard Waite, 43 Chambers avenue, Greenville, Pa. Regular meetings, third Thursday in month, except June, July and August.

RAILWAY CLUB OF PITTSBURGH.—J. D. Conway, 1941 Oliver Building, Pittsburgh, Pa. Regular meetings, fourth Thursday in month, except June, July and August, Fort Pitt Hotel, Pittsburgh, Pa.

RAILWAY FIRE PROTECTION ASSOCIATION.—P. A. Bissell, 40 Broad street, Boston, Mass. Annual meeting, October 19-20, 1937.

RAILWAY FUEL AND TRAVELING ENGINEERS' ASSOCIATION.—T. Duff Smith, 1255 Old Colony building, Chicago. Annual meeting, with exhibits, Hotel Sherman, Chicago, September 28, 29, 30.

RAILWAY SUPPLY MANUFACTURERS' ASSOCIATION. —J. D. Conway, 1941 Oliver Building, Pittsburgh, Pa. Meets with Mechanical Division and Purchases and Stores Division, Association of American Railroads. Exhibit June 16 to 23, inclusive, Atlantic City, N. J.

SOUTHERN AND SOUTHWESTERN RAILWAY CLUB.—A. T. Miller, P. O. Box 1205, Atlanta, Ga. Regular meetings, third Thursday in January, March, May, July and September. Annual meeting, third Thursday in November, Ansley Hotel, Atlanta, Ga.

TORONTO RAILWAY CLUB.—R. H. Burgess, Box 8, Terminal A, Toronto, Ont. Meetings, fourth Monday of each month, except June, July and August, at Royal York Hotel, Toronto, Ont.

TRAVELING ENGINEERS' ASSOCIATION.—See Railway Fuel and Traveling Engineers' Association.

WESTERN RAILWAY CLUB.—C. L. Emerson, executive secretary, 822 Straus Building, Chicago. Regular meetings, third Monday in each month, except June, July, August and September.

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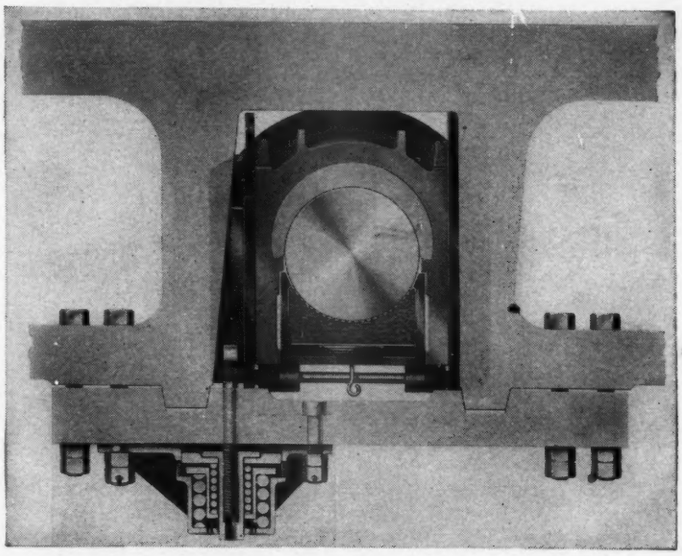

Driving Box Expansion

IS A TOUGH CUSTOMER

Expansion and contraction due to temperature change are tough customers—they can neither be avoided nor subdued. » » » When a locomotive leaves the roundhouse the driving boxes are at atmospheric temperature—expansion must be provided for. » » » The Franklin Automatic Compensator and Snubber provides for this expansion. It maintains accurate driving box fit at all times and the Snubber member provides a cushion to absorb unusual shocks. » » » With the Franklin Automatic Compensator and Snubber every part of the motion work is maintained in correct alignment, wear is reduced and maintenance costs far less. » » » Its twin, the Type E-2 Radial Buffer, maintains correct relationship between engine and tender and together they vastly improve the riding of the locomotive. » » » » » » » » » » » »

Franklin Type E-2 Radial Buffer dampens oscillation between engine and tender and makes for easier riding.

When maintenance is required, a replacement part assumes importance equal to that of the device itself and should be purchased with equal care. Use only genuine Franklin repair parts in Franklin equipment.

FRANKLIN RAILWAY SUPPLY COMPANY, INC.

NEW YORK CHICAGO MONTREAL

NEWS

N. Y. C. Rebuilding Passenger Cars

THE New York Central has placed in service on its Empire State Express two deluxe air-conditioned coaches, the first of 50 which it is rebuilding in its shops at Beech Grove, Indianapolis, Ind. The remaining 48 will be put in service, as rapidly as completed, on the company's principal trains between New York, Chicago, Cleveland, Ohio, Detroit, Mich., and St. Louis, Mo. For the Boston & Albany, 17 coaches are being air conditioned at Allston, Mass., and 8 additional coaches for the Pittsburgh & Lake Erie at the Beech Grove shops.

New Headlight on "400"

A NEW type headlight, which casts a gyrating beam of light in the shape of a figure eight, is being given its initial tests on the "400" of the Chicago & North Western, operating between Chicago and the Twin Cities. The new light, known as the Mars light, is of 3,000,000 candle power, and its reflector is oscillated by a motor which causes the beam to swing in arcs similar to a figure eight. The field of gyration of this figure eight is about 800 ft. in diameter at a distance of 1,000 ft., and precedes the locomotive a distance of 1,400 to 2,000 ft. The light is canary yellow in color and in yard tests it has been observed at a distance of three miles. The light itself is located on the top of the smokebox directly in front of the stack, which places it directly above the regular headlight. The light is expected to be of value as a warning signal when a train approaches crossings.

Eksergian Awarded 1937 Henderson Medal by Franklin Institute

Dr. Rupen Eksergian of the Edward G. Budd Manufacturing Company, Philadelphia, Pa., was awarded the 1937 George R. Henderson Medal of the Franklin Institute at the Medal Day Exercises of the Institute at Philadelphia on Wednesday, May 19. The Henderson medal, founded in 1924, is awarded for meritorious inventions or discoveries in the field of railway engineering. Dr. Eksergian was chosen as its recipient "In consideration of his contributions to railway engineering and his accomplishments in the field of railway locomotive and car design."

Lightweight Train and Locomotives for L., M. & S.

THE London, Midland & Scottish of Great Britain has completed the first of eleven lightweight trains, designed for long-distance excursion traffic, in which the use of high tensile steel and welding enables a reduction of 55 tons in weight compared with a 10-coach train of standard equipment, or 1.16 hundredweight less per passenger. Each 10-coach train comprises five two-coach units, and, by such articulation, there is a saving of 20 wheels per train.

The L., M. & S. has also placed orders for the construction of 85 new steam locomotives, according to the New York office of the Associated British and Irish Railways. Apart from five 4-6-2 engines to be built for the new high-speed express service between London and Glasgow, the new locomotives will comprise 15 standard six-coupled freight engines, 0-6-0 type, and 65 standard passenger tank engines, of a 2-6-2 wheel arrangement, for suburban service.

C. & E. I. to Use Lightweight Rail Cars

Two new streamline air-conditioned rail motor coaches, which will give short-run passengers the same modern service as that enjoyed by the passengers on long runs, will be placed in service by the Chicago & Eastern Illinois between Danville, Ill., and Cypress this month to supplement steam locomotive trains. On the 242-mile run between these points, each car will make one run a day under the present schedule. The cars, measuring 74½ ft., were constructed by the American Car & Foundry Company, and are equipped with Hall-Scott 200 hp. horizontal six-cylinder engines. Rapid acceleration and retardation of speeds feature the new cars.

Streamline Trains Between Bakersfield and Oakland

THE Atchison, Topeka & Santa Fe has asked the Railroad Commission of California for permission to improve its passenger service between Bakersfield, Cal.,

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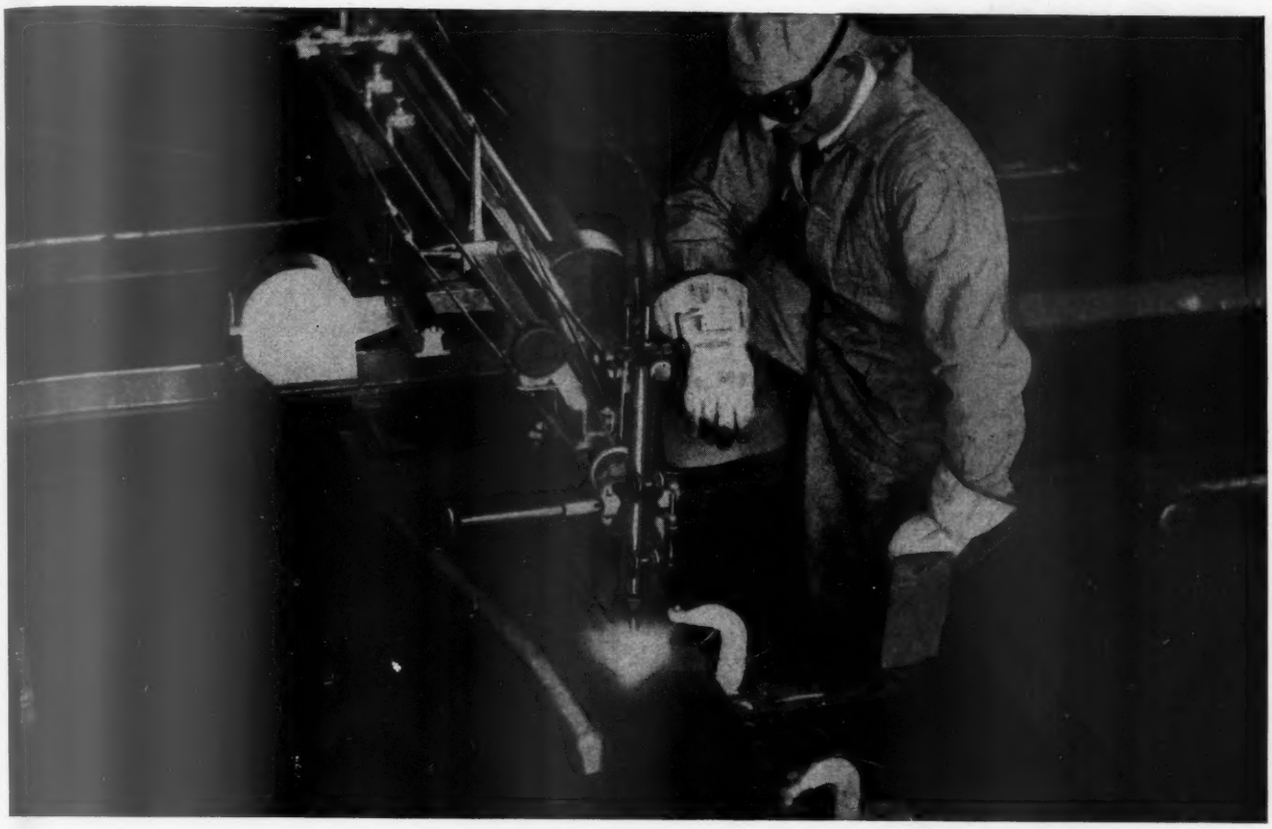

OXWELD PIONEERS
in the Cutting of Piled Plates

THE recently developed Oxweld process of cutting piled plates provides for railroads an economical means of fabricating large quantities of identical steel parts. Simple or intricate shapes can be produced by automatic oxy-acetylene cutting of piles of as many as twelve ¼-inch plates at one time.

With the Oxweld Shape-Cutting Machine, parts with smooth-finished edges are produced at high speed and with uniform contours. Production costs both in preparation and assembly are further reduced because sheets cut under this procedure conform accurately and uniformly to specifications.

These shape-cutting developments reflect the unique co-ordination of research and service facilities by which Oxweld contract customers benefit. For assistance in adapting the oxy-acetylene cutting process to your specific fabrication work, consult Oxweld.

THE OXWELD RAILROAD SERVICE COMPANY
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OXWELD
RAILROAD SERVICE

1912-1937

A QUARTER OF A CENTURY OF SERVICE
TO THE MAJORITY OF CLASS I RAILROADS

and Oakland with streamline trains and by co-ordinating its trains and busses. The railroad proposes to establish coordinated and integral one-ticket rail and bus service and to install two all-steel, streamlined, 1800 hp. Diesel-electric, five-car trains which it will operate on two six-hour schedules, each way, a day. Specifications for these trains have been completed by the Santa Fe and the Edward G. Budd Manufacturing Company.

Equipment Depreciation Orders

THE Interstate Commerce Commission in a series of sub-orders in No. 15100, Depreciation Charges of Steam Railroad Companies, has prescribed depreciation rates applicable to the equipment of six roads. They are the Atlantic & Yadkin; the Indianapolis Union; the New York, New Haven & Hartford; the Pittsburgh, Lisbon & Western; the Rahway Valley; and the Wrightsville & Tennille.

The composite percentages, which are not prescribed rates but merely the averages of percentages applied to the individual primary accounts, range from 3.13 per cent for the Wrightsville & Tennille to 10.38 per cent for the Atlantic & Yadkin. The composite figure for the New Haven is 3.25 per cent, derived from individual rates prescribed as follows: Steam locomotives, 2.91 per cent; other locomotives, 3.1 per cent; freight-train cars, 4.1 per cent; passenger-train cars, 2.72 per cent; floating equipment, 2.57 per cent; work equipment, 4.38 per cent; miscellaneous equipment, 15.46 per cent.

Metal Statistics—A Correction

THE thirtieth (not the thirteenth) annual edition of Metal Statistics is reviewed on page 220 of the May issue.

New Equipment Orders and Inquiries Announced Since the Closing of the May Issue

LOCOMOTIVE ORDERS

Road	No. of locos.	Type of loco.	Builder
Alton & Southern	1 [1]	2-8-2	American Loco. Co.
Patapsco & Back Rivers	3 [2]	600-hp. Diesel-elec.	Electro-Motive Corp.
	1 [2]	600-hp. Diesel-elec.	American Loco. Co.
Philadelphia, Bethlehem & New England	1 [2]	900-hp. Diesel-elec.	Electro-Motive Corp.
	3 [2]	600-hp. Diesel-elec.	
	1 [2]	900-hp. Diesel-elec.	American Loco. Co.
Seaboard Air Line	5	Loco. tenders	Baldwin Loco. Wks.
South Buffalo	2 [3]	600-hp. Diesel-elec.	Electro-Motive Corp.
	1 [2]	600-hp. Diesel-elec.	American Loco. Co.
Steelton & Highspire	1 [3]	600-hp. Diesel-elec.	American Loco. Co.
Wheeling & Lake Erie	10	6-wheel switch	Company shops

LOCOMOTIVE INQUIRIES

Litchfield & Madison	1	0-8-0	.....
	1	2-8-2	.....

FREIGHT-CAR ORDERS

Road	No. of cars	Type of car	Builder
Delaware & Hudson	100	40-ton box	Company shops
National Tube Co.	103	Bodies for 70-ton gondola	Ralston Steel Car Co.
Reading	300	50-ton single-door box	Company shops [4]
	250	50-ton double-door box	
	50	50-ton box, with end doors	
	50	All-steel flat	
Union Pacific	1,900	50-ton box	Company shops [5]
	700	50-ton auto-box	
	1,000	50-ton Ballast, Hart Selective	American Car & Fdry. Co.
	200	Tank	Gen. Amer. Trans. Corp.

FREIGHT-CAR INQUIRIES

Aliquippa & Southern	20	100-ton rack	.....
American R. R. of Porto Rico	40	5,000-gal. tank	.....
Cabot, Godfrey L., Inc.	20	35-ton steel covered hopper	.....

PASSENGER-CAR ORDERS

Road	No. of cars	Type of car	Builder
Ft. W. & D. C.	4	Pass.	Edward G. Budd Mfg. Co.

PASSENGER-CAR INQUIRIES

C. R. I. & P.	10	de luxe lightweight steel coaches	.....
G. M. & N.	2	Lightweight Cor-Ten steel sleeper-coaches	.....
Norfolk Southern	1	Rail motor office	.....

[1] To have 25 in. by 30-in. cylinders and a total weight in working order of 280,000 lb.
[2] Part of this equipment, which has already been delivered to the railroad, was ordered in the last quarter of 1936.
[3] Locomotive received by Steelton & Highspire.
[4] Inquiry is being made for underframes for these cars. In addition 50 hopper cars are to be converted into 50-ton cement hopper cars.
[5] The Ryan Car Company has received an order for 2,600 lightweight welded underframes for these cars.

Supply Trade Notes

THE EX-CELL-O AIRCRAFT & TOOL CORPORATION, Detroit, Mich., is now the Ex-Cell-O Corporation.

STANLEY T. SCOFIELD has been appointed assistant to vice-president of the United States Steel Corporation, New York.

JOSEPH T. RYERSON & SON, INC., has moved its downtown, Chicago, office from the Continental Illinois Bank building to the First National Bank building.

CLYDE GRIGSBY has been appointed western manager Railroad Division of the Socony-Vacuum Oil Company, Inc. Mr. Grigsby will have his headquarters at Chicago.

THE AMERICAN BRAKE SHOE & FOUNDRY CO., OF CALIFORNIA, has established its general offices at 1010 Russ building, San Francisco, Cal. A. L. Clark is president of this subsidiary company. The parent company is the American Brake Shoe & Foundry Co.

GEORGE MCM. GODLEY, who was president of the Burden Iron Company, Inc., Troy, N. Y., during 1935 and 1936, has been elected to fill the unexpired term of President Alfred Musso, who has resigned; Arthur S. Swan, vice-president, and Frank Hodson, assistant to the president, also resigned. O. A. Van Denburgh, Jr., a former manager of the company, has been placed in charge of operations.

RAYMOND C. BULLARD has been elected to the board of directors of The Bullard Company, Bridgeport, Conn., and will continue to serve as advertising and publicity manager of this company. Mr. Bullard, after graduating from college, spent six years as an engineering student in the various departments of The Bullard Company's manufacturing division. This was followed by a considerable period in the sales, engineering and advertising departments. For the last five years he has been advertising and publicity manager.

Raymond C. Bullard

P. A. MCGEE, assistant electrical engineer of the Reading-Jersey Central has resigned to join the sales department of the Electro-Motive Corporation. Mr. McGee will have his headquarters in the company's New York office at 230 Park avenue.

S. J. HALL, eastern manager of the Peerless Equipment Company, at New York, has resigned to serve as consulting engineer in the electrical field, specializing on design and installation of storage batteries, with headquarters at Chicago.

R. A. CARR, managing director of the Buenos Aires branch handling the South American business of the Dearborn Chemi-

(*Continued on next left-hand page*)

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PART	MATERIAL	OPERATION
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Air Compressors	Cast Iron	Bore
Compressor Pistons	Cast Iron	Turn-Bore
Cylinder Bushings	Gun Iron	Turn-Bore
Piston Packing Rings	Gun Iron	Turn-Bore
Bushings	Brass	Turn-Bore
Steam Pipes	Cast Iron	Bore
Throttle Valves	Cast Iron	Bore
Piston Valve Tool Rings	Gun Iron	Turn-Bore
Piston Valve Packing Rings	Gun Iron	Turn-Bore

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cal Company, has been elected vice-president with headquarters in Chicago to succeed C. M. Hoffman, who is now located in Los Angeles, Cal., where he is engaging in special work for the Dearborn Chemical Company. Mr. Carr was born at Oak Park, Ill., and after graduating from the University of Chicago, in 1926, engaged in advertising work. Later, he entered the employ of the Locomotive Firebox Company, Chicago, and in 1927 was a member of the dynamometer car staff of the Southern Pacific at San Francisco, Cal. In 1928, he reentered the employ of the Locomotive Firebox Company, engaging in sales and production work, which position he held until 1934, when he entered the employ of the Dearborn Chemical Company.

WALTER H. BASELT, assistant chief mechanical engineer of the American Steel Foundries, has been appointed chief mechanical engineer, with headquarters in Chicago, and has been succeeded by Robert B. Cottrell. Mr. Baselt, who received his technical education at Armour Institute in Chicago, joined the engineering force of the American Steel Foundries in 1916 and has been continuously employed with

(c) Moffett Studio

Walter H. Baselt

this company since that date, except for a period of service with the government. He became assistant chief mechanical engineer in 1929.

RICHARD M. RAMPORT has been appointed sales representative of the General American Transportation Corporation, with headquarters at Chicago, to assist in the sales of freight cars and special car equipment. O. J. Parks, manager of sales in the freight car department, has been appointed general superintendent of the tank car repair department, to succeed I. A. Eakins, retired.

Obituary

W. R. GELLATLY, president of the Superior Railway Products Corporation, Pittsburgh, Pa., died recently in Florida.

P. C. JACOBS, who served as president of the National Railway Appliances Association in 1919-20, died at Hollywood, Cal., on May 10. Mr. Jacobs retired about 10 years ago as a sales representative for the Johns-Manville Corporation at Chicago.

Personal Mention

General

FRANK ROSS, electrical engineer of the Terminal Railroad Association of St. Louis, has been promoted to superintendent of motive power and equipment, succeeding William Bawden who, at his own request, has been appointed mechanical consultant.

C. K. STEINS, whose appointment as assistant chief of motive power (locomotive) of the Pennsylvania was reported in the May, *Railway Mechanical Engineer*, was born at East Orange, N. J., on February 21, 1891. He entered the service

C. K. Steins

of the Pennsylvania on July 28, 1913, as special apprentice in the Altoona machine shop and on May 1, 1919, was transferred to the New York division as assistant master mechanic. On March 1, 1920, Mr. Steins was appointed assistant engineer motive power in New Jersey and on January 16, 1924, became assistant master mechanic of the Philadelphia division. He was appointed assistant engineer motive power, eastern region, on July 1, 1926, and on February 1, 1928, became master mechanic of the Indianapolis division. He was transferred to the Maryland division as master mechanic on October 1, 1929, serving in this capacity until his appointment as assistant chief of motive power under the chief of motive power at Philadelphia, Pa.

H. C. WRIGHT, assistant master mechanic of the Pittsburgh division of the Pennsylvania, has been appointed to the newly-created position of assistant engineer motive power of the Western region with headquarters at Chicago.

Master Mechanics and Road Foremen

W. O. TEUFEL, master mechanic of the Western Pennsylvania division of the Pennsylvania, has been transferred to the Columbus, Cincinnati and Toledo divisions with headquarters at Columbus, Ohio.

CHARLES ALEXANDER WILSON, who has been appointed master mechanic of the Pennsylvania at Williamsport, Pa., as noted in the May issue of the *Railway Mechanical Engineer*, was born on September 29,

C. A. Wilson

1885, at North East, Md. He attended Pereyville Public School; Jacob Tome Institute, Port Deposit, Md., and Drexel Institute. He became employed as a machinist apprentice in the Maryland division shops of the Pennsylvania at Wilmington, Del., on June 8, 1903. Upon the completion of his apprenticeship he served as a machinist until 1909; as gang foreman, electrical department, until 1911; as foreman, electrical department, until 1917; as electrical supervisor, W. J. & S. R. R., until 1918; as assistant master mechanic, W. J. & S. R. R., until 1923; and assistant master mechanic of the Trenton division of the Pennsylvania, until 1925. From 1925 to 1929, he was master mechanic of the Tyrone and Cresson division; from 1929 to 1933, master mechanic of the Atlantic division, and from 1933 to 1937, master mechanic of the Pennsylvania & Reading Seashore Line. He became master mechanic of the Central Pennsylvania division on April 16.

Shop and Enginehouse

H. J. CANTRELL, a machinist in the shops of the Chesapeake & Ohio at Huntington, W. Va., has been promoted to the position of assistant enginehouse foreman.

JAKE MILLER, a machinist in the shops of the Chesapeake & Ohio at Hinton, W. Va., has been promoted to the position of assistant night enginehouse foreman, succeeding A. R. Reed.

Purchasing and Stores

P. E. WELCH, general foreman at the general store of the Southern Pacific Lines in Texas and Louisiana at Houston, Tex., has been appointed assistant general storekeeper, with the same headquarters.

JOHN R. WATT, assistant purchasing agent of the Louisville & Nashville, has been advanced to general purchasing agent with headquarters as before at Louisville, Ky., to succeed Harry T. Shanks, who has retired because of ill health.